The Zebra Book of Facts for Boys

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This is a book of facts – a combination of information on all kinds of subjects and ideas for leisure moments. Whether you want to know the longest glacier in the world, the chemical formula for potassium aluminium sulphate, or just how to pass away the time on a long and boring journey, this book will provide the answer.

The Zebra Book of Facts for Boys

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The World - its History and Geography

Many of the scientific and technological feats listed in this book have been achieved in the past 100 years – some, such as exploring space, in the past 10 years – yet *anthropologists*, who study how man has evolved, tell us that it has taken almost 2 million years for *Homo sapiens* to reach his present advanced state of development.

What is perhaps even more surprising is that men did not start living together in organized communities until about 6,000 years ago. If the duration of the evolution of man is likened to a single day, the earliest of all recorded civilizations, the *Egyptiac*, began at about 5 minutes to midnight. For the previous $\frac{289}{290}$ part of his life on the Earth, man led an uncivilized existence – as a savage fending only for himself and his family.

Then as climatic conditions improved with the final recession of the last ice age (about 12,000 B.C.), men gradually began to live together in tribes which in turn gradually evolved into truly civilized societies. The majority of the civilizations had their origins in river valleys.

Civilized living implies more than individuals living together and working for the benefit of the community – this is the function of the tribe. But one of the benefits of tribal living was that improved communal methods of providing food – by primitive farming rather than hunting – for the first time gave man time to spare: he no longer had to devote all his waking hours to fighting for survival.

To fill in this leisure time man developed various forms of art – drawing, sculpture, architecture, writing and music – to express his thoughts. These are among the ingredients of civilizations, each one having characteristic styles of architecture and other art forms. As civilizations developed further trade, first by barter and then for money, prospered between cities. Religion and philosophy also played an important part in all civilized societies.

The following table lists 20 principal civilizations of man. There has been a general movement of civilizations westwards from the Nile and the Euphrates-Tigris deltas, the areas which benefited first from better climates and also the build-up of fertile silt in the river deltas – factors which enabled the citizens to raise their living standards and to enjoy

some leisure. The present Western civilization evolved from these earlier civilizations. However, other important civilizations evolved independently in other parts of the world.

Great Civilizations of Man

Name	*Duration (approx.)*	*Cradle*	*Derivation*
Egyptiac	4000 B.C.–A.D. 280	Lower Nile	Spontaneous
Sumeric	3500 B.C.–1700 B.C.	Euphrates–Tigris Delta	Spontaneous
Indic	3000 B.C.–A.D. 500	Indus and Ganges valleys	Possibly related to Sumeric
Minoan	2000 B.C.–1400 B.C.	Knossus and Crete	Spontaneous
Hittite	2000 B.C.–1200 B.C.	Turkey	Related to Minoan
Mayan	2000 B.C.–A.D. 1550	Guatemala	Spontaneous
Sinic	1600 B.C.–A.D. 220	Yellow River	Spontaneous
Babylonic	1500 B.C.–538 B.C.	Lower Mesopotamia	Related to Sumeric
Hellenic	1300 B.C.–A.D. 558	Greek mainland, Aegean Islands	Related to Minoan
Syriac	1200 B.C.–A.D. 970	Eastern Cilicia	Related to Minoan
Andean	100 B.C.–A.D. 1783	Peru	Spontaneous
Khmer	A.D. 100 –A.D. 1432	Cambodian coast	Possibly related to Indic and Sinic
Far Eastern	A.D. 589 –today	China, Japan, Korea	Related to Sinic
Western	A.D. 675 –today	Ireland	Related to Hellenic
Orthodox Christian (main)	A.D. 680 –today	Turkey	Related to Hellenic and Western
Hindu	A.D. 810 –today	Jamna-Ganges, India	Related to Indic
Orthodox Christian (Russian)	A.D. 950 –today	Upper Dnieper Basin	Related to Hellenic
Arabic	A.D. 975 –1525	Arabia, Iraq, Syria	Related to Syriac

Name	*Duration (approx)*	*Cradle*	*Derivation*
Mexic	A.D. 1075–1821	Mexican Plateau	Related to Mayan
Iranic	A.D. 1320–today	Oxus–Jaxartes Basin	Related to Syriac

Major Wars

It is only possible here to give the briefest outline of world history. In past centuries battles were fought in one place, after which the battle was usually named, some of the battles being isolated incidents in wars which may have lasted many years. In contrast, modern warfare tends to be much more mobile and although there were many fiercely fought engagements in the two World Wars, few can be classed as battles in the classic sense. The following list gives the dates of the more important wars.

B.C. 1200	Trojan War
431–04	Peloponnesian War
357–46	Sacred War
264–41	First Punic War
219–01	Second Punic War
149–46	Third Punic War
A.D. 1066–71	Norman Conquest of Britain
1265–84	Conquest of Wales
1290–1305	Conquest of Scotland
1306–42	Scots War of Independence
1336–1453	100 Years War
1455–71	Wars of the Roses
1588–1610	Conquest of Ireland
1618–48	Thirty Years War
1642–6	Civil War
1701–13	War of Spanish Succession
1740–8	War of Austrian Succession
1755–63	Seven Years War
1773–83	American War of Independence
1789–1815	Napoleonic Wars
1839–41	Opium War (China)
1853–6	Crimean War
1860–5	American Civil War
1898–1902	Boer War
1904–5	Russia–Japanese War
1914–18	World War I
1924	Chinese Civil War
1936–9	Spanish Civil War
1939–45	World War II
1950–3	Korean War
1945–	Vietnam Conflict

The United Nations

The United Nations (UN) is a world organization formed to maintain peace and security for all and to provide a means of co-operation in world affairs between nations. The UN came into existence on October

24, 1945 after 51 nations had signed the *United Nations Charter*, the document which sets out its objects. Membership of the United Nations now embraces 115 sovereign states plus the two USSR republics of Byelorussia and the Ukraine.

Principal UN Organs

The General Assembly consists of all member nations of the UN, each nation having up to five representatives, but only one vote. The General Assembly meets regularly once a year in September, but special meetings may be held at any time to deal with emergencies. The Assembly has seven main committees (1) Political and Security, (2) Economic and Financial, (3) Social, Humanitarian and Cultural, (4) Trusteeship, (5) Administration and Budgetary, (6) Legal and (7) Special Political.

The Security Council is made up of eleven nations, each with one representative and one vote. There are five permanent members – China, France, UK, USA and USSR – and six members elected to serve a two-year term. The Security Council deals with problems concerning *international* peace and security. On any question before it, all permanent members must agree to the discussion; if any permanent member does not agree – i.e. uses the *veto* – the Security Council can take no action. But if the question to be discussed concerns one of the permanent members, that member is not allowed to vote.

The Economic and Social Council deals with such matters as economics, education, health and culture with particular responsibility for assisting the developing countries. It works directly to the instructions of the General Assembly and has set up commissions which investigate world conditions on the following subjects: Economics and Employment, Transport and Communications, Human Rights, Statistics, Status of Women, Drug Traffic, Population and International Commodity Trade.

The Trusteeship Council has the task of caring for territories which are placed under UN trusteeship, or for delegating that care to suitable member states. The territories cared for in this way are: New Guinea (by Australia), Nauru (Australia), Marshall Islands (USA), Marianas (USA), Caroline Islands (USA). Eight other former UN Trust Territories such as Tanganyika and Western Samoa have reached full statehood.

The International Court of Justice comprising 15 judges from different nations gives judgement in cases of dispute between nations. As in the

case of other courts, it has a Court of Appeal (the Security Council) to which any member dissatisfied with its findings can go.

The Secretariat is the international civil service of the UN. The head of the Secretariat, appointed by the General Assembly, is known as the Secretary General. So far, three people have held this appointment:

1946–52 Trygve Lie (Norway)
1953–61 Dag Hammarskjoeld (Sweden)
1961–71 U Thant (Burma)
1971– Dr Kurt Waldheim (Austria)

UN Agencies

There are 15 other bodies associated with the UN which undertake special and expert work, such as:

The United Nations Educational, Scientific and Cultural Organization (UNESCO) whose purpose is to promote education and the spread of culture among the nations so that they will understand each other better and gain the knowledge which will help them to raise their standards of living. Almost every country in the world is in membership. Headquarters: Paris.

Food and Agriculture Organisation (FAO) has the special function of helping its member nations to raise standards of food production throughout the world, improve the conditions of life of agricultural workers, and study and give information on nutrition generally. Almost every country is in membership. Headquarters: Rome.

International Civil Aviation Organisation (ICAO) helps to co-ordinate civil aircraft traffic between nations and lays down standards of safety for aircraft and standards of efficiency for crews. Headquarters: Montreal.

International Labour Organisation (ILO) studies ways of improving labour conditions, protecting foreign workers and raising the standards of living of working people everywhere. Headquarters: Geneva.

World Health Organisation (WHO) studies health and advises upon and assists in fighting disease. Headquarters: Geneva.

The Universal Postal Union (UPU), the International Telecommunication Union (ITU), the International Atomic Energy Agency (IAEA), the General Agreement on Tariffs and Trade (GATT) and the International Monetary Fund (IMF) are some of the other UN agencies.

In the UK an organization known as *The United Nations Association (UNA)* exists to promote the ideals of the UN. Membership is open to anybody, and members may attend meetings of local branches. Further details of UNA are available from its headquarters at 93 Albert Embankment, London, S.E.1.

Journeys of Exploration and Discovery

Date	*Explorer (and Nationality)*	*Achievement*
B.C. 450	Hanno (Carthagian)	Led 60 fifty-oared ships round the African coast as far as Sierra Leone.
330–323	Alexander the Great (Macedonian)	Marched through Persia to India and back to Babylon.
A.D. 982	Eric the Red (Viking)	Discovered Greenland.
1000	Leif Ericsson (Viking)	Reached North America (Newfoundland)
1253–5	Gullelmus de Rubruquis (French)	Journeyed through Crimea, Caucasus, Asia Minor to Tripoli.
1255	Nicolo and Maffeo Polo (Venetian)	Reached Peking.
1271–94	Marco Polo (Venetian)	Journeyed through Asia.
1325–54	Ibn Batutu (Arab)	Journeyed from Tangiers via Mecca and Persia around the shores of the Indian and Pacific Oceans to China.
1300s	João Zarco and Tristão Vas (Portuguese)	Discovered Madeira and the Azores.
1487–8	Bartholomew Diaz (Portuguese)	Rounded Cape of Good Hope.
1492–6	Christopher Columbus (Italian)	Discovered San Salvador, Antigua, Bahamas, Cuba, Guadeloupe, Haiti, Jamaica, Montserrat and Puerto Rico.
1497	John Cabot (Genoese)	Discovered Cape Breton Island, Newfoundland and Nova Scotia.
1496–1503	Amerigo Vespucci (Florentine)	Explored Mexico and parts of the east coast of Central and South America.

Date	*Explorer (and Nationality)*	*Achievement*
1498	Vasco da Gama (Portuguese)	Discovered sea-route from Europe to India, round the Cape of Good Hope.
1498	Christopher Columbus (Italian)	Landed in South America.
1499	Vincente Pinzon (Portuguese)	Discovered Brazil and the Amazon.
1501–16	Various Portuguese navigators	Discovered Canton, Ceylon, Goa, Japan, Malacca and the Islands of the East Indies.
1502–4	Christopher Columbus (Italian)	Discovered Trinidad.
1509	Sebastian Cabot (Genoese)	Explored America's east coast from Florida to mouth of River Plate.
1513	Vasco Nunez de Balboa (Spanish)	Crossed Panamas Isthmus and sighted Pacific Ocean.
1520	Hemàn Cortés (Spanish)	Conquered Mexico.
1519–22	Ferdinand Magellan (Portuguese)	Sailed round the World, discovering Magellan Strait and the Philippine Islands.
1534–6	Jacques Cartier (French)	Discovered Canada and explored St. Lawrence River.
1539	De Soto (Spanish)	Discovered Florida, Georgia and River Mississippi.
1554	Hugh Willoughby and Richard Chancellor (English)	Discovered the White Sea and sea-route to Russia.
1557–80	Francis Drake (English)	Sailed round the World in the *Golden Hind*.
1576	Martin Frobisher (English)	Started search for the North-West Passage to the Pacific.
1587	John Davis (English)	Discovered Davis Strait between Atlantic and Arctic Oceans.
1606	William Janszoon (Dutch)	Discovered Australia.
1606	John Smith (British)	Explored Chesapeake Bay discovering Potomac and Susquehannah.
1611	Henry Hudson (British)	Sought North-East and North-West Passages and discovered Hudson Bay, River and Strait.

Date	*Explorer (and Nationality)*	*Achievement*
1615	William Baffin (British)	Explored Baffin Bay and Baffin Island while searching for the North-West Passage.
1642–4	Abel Tasman (Dutch)	Discovered Fiji, New Zealand, Tasmania and Tonga.
1700	William Dampier (British)	Explored west coast of Australia.
1728	Vitus Bering (Danish)	Discovered Bering Strait between Asia and America.
1740–4	George Anson (British)	Sailed round the World in the *Centurion*.
1767	Samuel Wallis (British)	Discovered Tahiti.
1768–71	James Cook (British)	Sailed round the World in the *Endeavour*, charting the coast of New Zealand and the east coast of Australia.
1772–6	James Cook (British)	Discovered (in two further voyages) Cook Is., Easter Is., New Caledonia, Norfolk Is., and Hawaiian Is.
1795–7	Mungo Park (British)	Followed course of River Niger.
1821–3	James Weddell (British)	Discovered South Orkneys and Weddell Sea.
1822–5	Hugh Clapperton, Dixon Denham and Walter Oudney (British)	Expedition through Sudan to Lake Chad.
1827–8	René Caillié (French)	Crossed north-west Africa from Sierra Leone to Tangiers *via* Timbuktu.
1828–45	Charles Sturt (British)	Followed Darling and Murray Rivers and penetrated central Australia beyond Lake Eyre.
1831	James Clark Ross and John Ross (British)	Located North Magnetic Pole.
1839–43	James Clark Ross (British)	Discovered Mounts Erebus and Terror, Ross Ice Barrier and Victoria Land (Antarctica).
1849–73	David Livingstone (British)	Followed the course of the River Zambesi and discovered Victoria Falls and Lake Nyasa.
1856	John Speke (British)	Discovered Lake Tanganyika.

Date	*Explorer (and Nationality)*	*Achievement*
1858	John Speke (Br.)	Discovered Lake Victoria Nyanza.
1862	John Speke and J. A. Grant (Br.)	Discovered source of the White Nile.
1864	Samuel Baker (Br.)	Discovered Lake Albert Nyanza.
1869–74	Gustav Nachtigal (Ger.)	Crossed North Africa from Tripoli, *via* Fezzan and Bornu to Cairo.
1870–2	Henry Stanley (Br.)	Met and explored with David Livingstone.
1872–4	Julius von Payer and K. Weyfrecht (Boh.)	Discovered Franz Josef Land.
1874–7	Henry Stanley (Br.)	Followed course of River Congo.
1890–1909	Sven Hedin (Sw.)	Journeyed through Central Asia to Tibet and China.
1901	Robert Falcon Scott (Br.)	Discovered King Edward VII Land.
1903–6	Roald Amundsen (Nor.)	First navigated the North-West Passage.
1909	Robert Peary (US)	Reached North Pole.
1911	Roald Amundsen (Nor.)	Reached South Pole (Dec. 14).
1912	Robert Falcon Scott (Br.)	Reached South Pole (Jan. 18).
1953	Edmund Hillary (NZ) & Sherpa Tensing (Nepal.)	Climbed Mount Everest.
1957–8	Vivian Fuchs (Br.) & Edmund Hillary (NZ)	Crossed Antarctic continent *via* South Pole.
1961	Yuri Gargarin & Gherman Titov (Rus.)	First journey into space.
1968–9	Wally Herbert, Alan Gill, Roy Koerner, Ken Hedges (Br.)	Crossed Arctic Ocean *via* North Pole.
1969	Neil Armstrong & Edwin Aldrin (US)	First landing on moon.

The World's Continents and Oceans

The total area of the surface of the Earth is about 197 million square miles, of which water covers about 139·1 million square miles or more accurately 70·8 per cent.

The Continents

The Earth's land surface embraces seven continents with their associated islands. By definition a continent is a large land mass, not broken by a large stretch of sea, so Europe, Africa and Asia are physically, though not politically, one continent known as Afro-Euroasia. Oceania includes Australia, New Zealand and the non-Asia Pacific Islands. The sizes and populations of the continents in millions are shown below:

Continent	*Sq. miles*	*Populations*
Europe	4·1 m.*	449 m.†
Asia	17·0 m.	1,855 m.†
(Russia)	—	233·5 m.
North and Central America	9·3 m.	296 m.
South America	6·8 m.	172 m.
Africa	11·7 m.	319 m.
Oceania	3·2 m.	18 m.
Antarctica	5·2 m.	
Total	57·3 m.	3,342 m.

* Including 2·2 m. sq. miles of USSR territory west of the Ural Mountains.
† Excluding USSR.

The Oceans and Great Seas

The three oceans (Atlantic, Indian and Pacific) of the World, together with the Arctic Sea form one vast mass of water. *Seas* are smaller, more self-contained portions of the oceans, such as the Mediterranean Sea, which is almost entirely surrounded by land. If the adjacent seas are detached, and the Arctic Sea regarded as an ocean, the ocean areas in millions of square miles, are:

Atlantic	31·8
Pacific	63·8
Indian	28·3
Arctic	5·4
Other Seas (see p. 37)	9·8
Total	139·1

Nations of the World and their Capitals

Country	*Capital City*
Europe	
Albania	Tirana
Andorra	Andorra La Vella
Austria	Vienna
Belgium	Brussels
Bulgaria	Sofia
Cyprus	Nicosia
Czechoslovakia	Prague
Denmark	Copenhagen
Finland	Helsinki
France	Paris
Germany, West	Bonn
East	E. Berlin
Gibraltar	Gibraltar
Greece	Athens
Hungary	Budapest
Iceland	Reykjavik
Irish Republic	Dublin
Italy	Rome
Liechtenstein	Vaduz
Luxembourg	Luxembourg
Malta	Valetta
Monaco	Monaco-Ville
Netherlands	Amsterdam
Norway	Oslo
Poland	Warsaw
Portugal	Lisbon
Rumania	Bucharest
San Marino	San Marino
Spain	Madrid
Sweden	Stockholm
Switzerland	Berne
United Kingdom	London
England	London
Wales	Cardiff
Scotland	Edinburgh
N. Ireland	Belfast
Isle of Man	Douglas
Jersey	St. Helier
Guernsey	St. Peter Port
USSR (Europe)	Moscow
Byelorussia	Minsk
Estonia	Tallinn
Latvia	Riga
Lithuania	Vilnuis
Moldavia	Kishinev
RSFSR (Europe)	Moscow
Ukraine	Kiev
Vatican	Vatican City
Yugoslavia	Belgrade
Asia	
Afghanistan	Kabul
Bahrain	Manama
Bangla Desh	Dacca
Bhutan	Punakha
Brunei	Brunei Town
Burma	Rangoon
Cambodia	Phnom Penh
Ceylon (now Sri Lanka)	Colombo
China, Mainland	Peking
Taiwan (Formosa)	T'aipei
Hong Kong	Victoria
India	New Delhi
Indonesia	Jakarta
Iran (Persia)	Teheran
Iraq	Baghdad
Israel	Jerusalem
Japan	Tokyo
Jordan	Amman
Korea, North	P'yongyang
South	Seoul
Kuwait	Kuwait City
Laos	Vientaine
Lebanon	Beirut
Malaysia	Kuala Lumpur
Malaya	Kuala Lumpur
Sabah	Jesselton

Country	*Capital City*
Sarawak	Kuching
Maldive Is.	Malé
Mongolia	Ulan Bator
Muscat and Oman	Muscat
Nepal	Katmandu
Pakistan	Islamabad
Philippine Is.	Quezon City
Qatar	Doha
Ryukyu Is.	Naha City
Saudi Arabia	Riyadh
Sikkim	Gangtok
Singapore	Singapore City
Syria	Damascus
Thailand	Bangkok
Timor	Dili
Trucial Oman	Dubai
Turkey	Ankara
USSR (Asia)	Moscow
Armenia	Yerevan
Azerbaydzhan	Baku
Georgia	Tbilisi
Kazakhstan	Alma Ata
Kirghizia	Frunze
RSFSR (Asia)	Moscow
Tadzhikstan	Dushanbe
Turkmemstan	Ashkhabad
Uzbekistan	Tashkent
Vietnam, North	Hanoi
South	Saigon
Yemen	Taiz
S. Yemen	Aden

Africa

Afars and Issas	Djibouti
Algeria	Algiers
Angola	São Paulo de Luanda
Ascension Is.	Georgetown
British Indian Ocean Territory	Mahé, Seychelles
Botswana (Bechuanaland)	Gaberones
Burundi	Bujumbura
Cameroon	Yaoundé
Cape Verde Is.	Praia
Central African Republic	Bangui
Chad	Fort-Lamy
Comoro Is.	Moroni
Congo Republic	Kinshasa
Congo	Brazzaville
Dahomey	Porto-Novo
Ethiopia and Eritrea	Addis Ababa
Gaboon	Libreville
Gambia	Banjun
Ghana	Accra
Guinea	Conakry
Ifní	Sidi Ifní
Ivory Coast	Abidjan
Kenya	Nairobi
Lesotho	Maseru
Liberia	Monrovia
Libya	Tripoli, Benghazi
Madagascar (Malagasy Republic)	Tananarive
Malawi	Zomba
Mali	Bamako
Mauritania	Nouakchott
Mauritius	Port Louis
Morocco	Rabat
Mozambique	Lourenco Marques
Niger	Niamey
Nigeria	Lagos
Portuguese Guinea	Bissau
La Réunion	St. Denis
Rhodesia	Salisbury

Country	*Capital City*
Rwanda	Kigali
St. Helena	Jamestown
São Tomé and Principe	São Tomé
Sénégal	Dakar
Seychelles	Port Victoria
Sierra Leone	Freetown
Somalia	Mogadishu
South Africa	Pretoria, Cape Town
South West Africa	Windhoek
Spanish Guinea	Santa Isabel
Spanish Sahara	El Aiun
The Sudan	Khartoum
Swaziland	Mbabane
Tanzania (Tanganyika and Zanzibar)	Dar es Salaam
Togo	Lomé
Tristan da Cunha	Edinburgh
Tunisia	Tunis
Uganda	Kampala
United Arab Republic	Cairo
Upper Volta	Ouagadougou
Zambia	Lusaka
North and Central America	
Antigua	St. Johns
Bahamas	Nassau
Barbados	Bridgetown
Bermuda	Hamilton
Brit. Honduras	Belize
Canada	Ottawa
Cayman Is.	Georgetown
Costa Rica	San José
Cuba	Havana
Dominica	Roseau
Dominican Republic	Santo Domingo
El Salvador	San Salvador
Greenland	Godthaab
Grenada	St. George's
Guadeloupe	Point-a-Pitre
Guatemala	Guatemala City
Haiti	Port-au-Prince
Honduras	Tegucigalpa
Jamaica	Kingston
Martinique	Fort de France
Mexico	Mexico City
Montserrat	Plymouth
Netherlands Antilles	Willemstad
Nicaragua	Managua
Panama	Panama City
Panama Canal Zone	Balboa
Puerto Rico	San Juan
St. Pierre and Miquelon	St. Pierre
St. Kitts-Nevis-Anguilla	Basseterre
St. Lucia	Castries
St. Vincent	Kingstown
Trinidad and Tobago	Port-of-Spain
Turks and Caicos Is.	Grand Turk
United States of America	Washington, DC
Virgin Is. (British)	Road Town
(US)	Charlotte Amalie
South America	
Argentina	Buenos Aires
Bolivia	La Paz
Brazil	Brasília

Country	*Capital City*
Chile	Santiago
Colombia	Bogota
Ecuador	Quito
Falkland Is.	Port Stanley
French Guinea	Cayenne
Guyana	Georgetown
Paraguay	Asuncion
Peru	Lima
Surinam	Paramaribo
Uruguay	Montevideo
Venezuela	Caracas
Oceania	
Australia	Canberra
British Solomon Is.	Honiara
Cook Islands	Avarua
Fiji	Suva

Country	*Capital*
French Polynesia	Papeete
Gilbert and Ellice Is.	Tarawa
Guam	Agana
Hawaii	Honolulu
Nauru	Nauru
New Caledonia	Nouméa
New Hebrides	Vila
New Zealand	Wellington
Niue	Alofi
Papua and New Guinea	Port Moresby
Pitcairn Is.	Adamstown
Samoa, Eastern	Pago-Pago
Western	Apia
Tokelau Is.	—
Tonga	Nuku'alofa

Largest Cities of the World

Populations in the following list are given to the nearest tenth of a million and are only approximate. City populations change, usually upwards, partly because of natural increase but also through city boundaries being altered.

City (and Country)	*Population (m.)*	*City (and Country)*	*Population (m.)*
Tokyo (Japan)	10·9	Chicago (USA)	3·6
New York (USA)	8·1	Rio de Janeiro (Brazil)	3·6
London (UK)	7·9	Cairo (UAR)	3·5
Buenos Aires (Argentina)	7·0	Berlin (Germany)	3·3
Shanghai (China)	6·9	Osaka (Japan)	3·2
Moscow (USSR)	6·5	Tientsin (China)	3·2
Mexico City (Mexico)	5·3	Seoul (South Korea)	3·0
Calcutta (India)	4·6	Jakarta (Indonesia)	2·9
Bombay (India)	4·5	Paris (France)	2·8
São Paulo (Brazil)	4·5	Madrid (Spain)	2·6
Peking (China)	4·0	Los Angeles (USA)	2·5
Leningrad (USSR)	3·7	Rome (Italy)	2·5

City (and Country)	*Population (m.)*	*City (and Country)*	*Population (m.)*
Shenyang (China)	2·4	Philadelphia (USA)	2·7
Sydney (Australia)	2·3	Melbourne (Australia)	2·1
Chungking (China)	2·1	Wuhan (China)	2·1

Largest Islands

Island	*Ocean*	*Area (sq. miles)*
Australia	Pacific	2,948,000
Greenland	Arctic	840,000
New Guinea	Pacific	317,000
Borneo	Indian	287,000
Baffin Land	Arctic	235,000
Madagascar	Indian	228,800
Sumatra	Indian	163,000
Honshu, Japan	Pacific	88,500
Great Britain	North Atlantic	84,186
Ellesmere Island	Arctic	82,100
Victoria Island	Arctic	81,900
Celebes	Indian	73,000
South Island, New Zealand	Pacific	58,093
Java	Indian	48,600
North Island, New Zealand	Pacific	44,281
Cuba	Atlantic	44,204
Newfoundland	North Atlantic	42,734
Luzon, Philippines	Pacific	41,000
Iceland	North Atlantic	39,700
Mindanao, Philippines	Pacific	37,000
Hokkaido, Japan	Pacific	34,700
Novaya Zemlya	Arctic	32,000
Ireland	North Atlantic	31,839
Hispaniola	Atlantic	29,530
Sakhalin	Pacific	29,100
Tasmania	Pacific	26,215
Ceylon (Sri Lanka)	Indian	25,400

Highest Mountains

Name	*Range*	*Height (feet)*
Everest	Himalayas	29,028
Godwin Austen (K2)	Karakoram	28,250

Name	*Range*	*Height (feet)*
Kangchenjunga I	Himalayas	28,208
Lhotse I	Himalayas	27,923
Makalu I	Himalayas	27,824
Dhaulagiri I	Himalayas	26,810
Manaslu I	Himalayas	26,760
Cho Oyu	Himalayas	26,750
Nanga Parbat	Himalayas	26,660
Annapurna I	Himalayas	26,504
Gasherbrum I	Karakoram	26,470
Broad Peak I	Karakoram	26,400
Gasherbrum II	Karakoram	26,360
Shisa Pangma	Himalayas	26,291
Gasherbrum III	Karakoram	26,090
Annapurna II	Himalayas	26,041
Gasherbrum IV	Karakoram	26,000

Active Volcanoes

Name	*Range (or Country)*	*Height (feet)*
Guallatiri	Andes	19,882
Lascar	Andes	19,652
Cotopaxi	Andes	19,347
Tupungatito	Andes	18,504
Popocatepetl	Altiplano de Mexico	17,887
Sangay	Andes	17,749
Tungurahua	Andes	16,512
Cotacachi	Andes	16,197
Purace	Andes	15,604
Klyvuchevskaya	Sredinnyy Khrebet	15,584
Wrangell	Alaska	14,005
Tajumulco	(Guatemala)	13,812
Mauna Loa	(Hawaii)	13,680
Cameroon Mountain	(Cameroon)	13,350

Highest and Lowest Points in Each Continent

Continent	*Highest Point*	*Country*	*Height (feet)*
Africa	Mt. Kilimanjaro	Tanzania	19,340
N. America	Mt. McKinley	Alaska	20,320
S. America	Cerro Aconcagua	Argentina	22,834
Antarctica	Vinson Massif	Sentinel Range	16,860

Asia	Everest	Nepal–Tibet	29,028
Europe	Mt. Elbruz	USSR	18,481
Oceania	Mt. Sukarno	Indonesia	17,096

Continent	*Lowest Point*	*Country*	*Depth below Sea Level*
Africa	Munkhafad el Qattara	Egypt	436
N. America	Death Valley	USA	282
S. America	Rio Negro	Argentina	98
Antarctica		Marie Byrd Land	8,100 (ice-filled)
Asia	Dead Sea	Jordan	1,286
Europe	Zuider Zee	Netherlands	16
Oceania	Lake Eyre	Australia	38

Ocean Deeps

Name	*Ocean*	*Greatest Depth (feet)*
Mariana Trench	West Pacific	35,760
Tonga-Kermadec Trench	South Pacific	35,598
Philippine Trench	West Pacific	34,578
Kuril-Kamchatka Trench	West Pacific	34,062
Japan Trench	West Pacific	34,038
Solomon Trench	South Pacific	29,988
Puerto Rico Trench	West Atlantic	27,498
South Sandwich Trench	South Atlantic	27,112
Diamantina Trench	Indian	26,400
Yap Trench	West Pacific	26,280
Peru–Chile Trench*	East Pacific	26,160
Aleutian Trench	North Pacific	25,194
Romanche Trench	Atlantic	25,050

* This is believed to be the longest deep sea trench extending for some 2,200 miles.

Seas and Lakes

Name	*Location*	*Area (sq. miles)*
Malay Sea	Far East	3,144,000
Caribbean Sea	West Indies	1,063,000
Mediterranean Sea	Europe, Africa	967,000
Bering Sea	Alaska, Siberia	876,000

Name	*Location*	*Area (sq. miles)*
Gulf of Mexico	North America	596,000
Sea of Okhotsk	East Siberia	590,000
East China Sea	Far East	482,000
Hudson Bay	Canada	476,000
Sea of Japan	Far East	389,000
Andaman Sea	Burma	308,000
North Sea	NW Europe	222,000
Black Sea	Russia, Turkey	178,000
Caspian Sea	Russia, Iran	170,000
Red Sea	Africa, Arabia	169,000
Baltic Sea	Scandinavia	163,000
Persian Gulf	Persia	92,200
Gulf of St. Lawrence	Canada	91,800
Lake Superior	Canada	31,820
Lake Victoria	Africa	26,300
Aral Sea	Kazakhstan	26,200
Lake Huron	Canada, USA	23,010
Lake Michigan	USA	22,400
Lake Baikal	Siberia	13,200
Lake Tanganyika	Africa	12,700
Great Bear Lake	Canada	12,200
Great Slave Lake	Canada	11,200
Lake Malawi	Africa	11,000

Longest Rivers

Name	*Location*	*Length (miles)*
Amazon	South America	4,195
Nile	North Africa	4,145
Mississippi-Missouri	USA	3,710
Yenisey-Angara-Selenga	USSR	3,690
Ob-Irtysh	USSR	3,460
Yangtse Kiang	China	3,400
Hwang Ho (Yellow River)	China	3,000
Congo	Central Africa	2,720
Amur-Argun'	China	2,700
Lena-Kirenga	Central Siberia	2,650
Mackenzie-Peace	Canada	2,630
Mekong	Asia	2,600

Name	*Location*	*Length (miles)*
Niger	West Africa	2,600
La Plata Parana	South America	2,500
Murray-Darling	Australia	2,300
Volga	USSR	2,290

Great Waterfalls – by height

Name	*River*	*Location*	*Height (feet)*
Angel	Carrao	Venezuela	3,212
Tugela	Tugela	Natal	3,110
Utigard	Jostedal Glacier	Norway	2,625
Mongefossen	Monge	Norway	2,540
Yosemite	Yosemite Creek	USA	2,425
Ostre Mardola Foss	Mardals	Norway	2,154
Tyssestrengane	Tysso	Norway	2,120
Kukenaom	Arabopo	Venezuela	2,000
Sutherland	Arthur	New Zealand	1,904
Kjellfossen	Naerofjord feeder	Norway	1,841
Ribbon	Ribbon Fall Stream	USA	1,612
King George VI	Utshi	Guyana	1,600
Wollomombi	Wollomombi	Australia	1,580
Roraima	Mazaruni	Guyana	1,500

Great Waterfalls – by volume

Name	*River*	*Mean Annual Flow (cu. ft. per sec.)*	*Height (feet)*
Stanley	Congo	600,000	200
Guaíra	Alto Paraná	470,000	374
Khone	Mekong	410,000	70
Niagara	Niagara	212,000	167
Paulo Afonso	São Francisco	100,000	192
Uruburpanga	Alto Paraná	97,000	40
Cataratas del Iguazu	Iguazǫ	61,660	308
Patos-Maribondo	Rio Grande	53,000	115
Victoria	Zambezi	38,430	355
Grand	Hamilton	35,000	245
Kaieteur	Potaro	23,400	741

Longest Glaciers

Name	*Length (miles)*
Lambert–Fisher Ice Passage, Antarctica	320
Novaya Zemlya, North Island, USSR	260
Arctic Institute Ice Passage, Victoria Land, Antarctica	225
Nimrod–Lennox–King Ice Passage, Antarctica	180
Denman Glacier, Antarctica	150
Beardmore Glacier, Antarctica	140
Recovery Glacier, Antarctica	140
Petermanns Gletscher, Knud Rasmussen Land, Greenland	124
Un-named Glacier, Ross Ice Shelf, Antarctica	120
Slessor Glacier, Antarctica	115

Principal Deserts

Name	*Countries*	*Area (sq. miles)*
Sahara	Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Spanish Sahara, Sudan, Tunisia	3,250,000
Australian	Australia	600,000
Arabian	Saudi Arabia, People's Republic of South Yemen	500,000
Gobi	Inner and Outer Mongolia	400,000
Kalahari	Botswana	200,000
Takla Makan	Sinkiang, China	125,000
Kara Kum	Turkmenistan, USSR	105,000
Thar	India, West Pakistan	100,000

Famous Bridges

The lengths given opposite are the distances between the main supporting structures (*i.e. the span*), which with most really long bridges are less than the widths of the waterway spanned. The actual length of a bridge system, including approach roads, is often very much longer. For example the Lake Ponchartrain Causeway linking Mandeville to Jefferson, Louisiana is over 23¾ miles long.

Suspension Bridges

Name	*Location*	*Span (feet)*
Verrazano Narrows	Brooklyn-Staten Is., USA	4,260
Golden Gate	San Francisco Bay, USA	4,200
Mackinac Straits	Straits of Mackinac, Mich., USA	3,800
George Washington	Hudson River, New York City, USA	3,500
Salazar Bridge	Lisbon, Portugal	3,323
Firth of Forth (road)	Firth of Forth, Scotland	3,300
Severn	Severn Estuary, England, Wales	3,240
Tacoma Narrows	Washington, USA	2,800

Cantilever Bridges

Name	*Location*	*Span (feet)*
Quebec	St. Lawrence River, Canada	1,800
Firth of Forth (rail)	Firth of Forth, Scotland	1,710
Greater New Orleans	Algiers, Mississippi River, USA	1,575
Howrah	Calcutta, India	1,500
Transbay	San Francisco, USA	1,400
Yokohama	Yokohama, Japan	1,250
Nyack-Tarrytown	Hudson River, NY, USA	1,212
Longview	Columbia River, Wash., USA	1,200

Steel Arch Bridges

Name	*Location*	*Span (feet)*
Bayonne	Bayonne, NJ–Staten Is., USA	1,652
Sydney Harbour	Sydney, Australia	1,650
Zdakov	Vltava River, Czechoslovakia	1,090
Runcorn-Widnes	Runcorn-Widnes, England	1,082
Nagasaki	Nagasaki, Japan	1,042
Glen Canyon	Colorado River, USA	1,028

Longest Vehicular Tunnels

Tunnel	*Location*	*Purpose*	*Length (miles)*
Morden–East Finchley	London	Underground Railway	17¼
Golders Green–South Wimbledon	London	Underground Railway	16
Simplon	Switzerland–Italy	Railway	12¼

Tunnel	*Location*	*Purpose*	*Length (miles)*
Appenine	Italy	Railway	11½
St. Gotthard	Switzerland	Railway	9¼
Lötschberg	Switzerland	Railway	9
Hokurika	Japan	Railway	8½
Frejus	France–Italy	Railway	8½
Cascade	S. Dakota, USA	Rail and water	7¾
Mont Blanc	France–Italy	Road traffic	7¼
Arlberg	Austria	Railway	6½
Moffat	Colorado, USA	Railway	6
Kammon	Japan	Road traffic	6
Shimizu	Japan	Railway	6
Rimu Taka	New Zealand	Railway	5½

Water supply tunnels or aqueducts having only moderate diameters are even longer than the longest vehicular tunnels. The longest aqueduct built to date runs 85 miles from Rondout Reservoir to Manhattan Island, New York.

Ship Canals

Ship canals and ordinary canals differ from one another in that the former can carry cargo ships, while the latter are only wide and deep enough for barge traffic. Barge canals sometimes run for hundreds of miles, but ship canals only are listed below.

Canal	*Country*	*Joining*	*Length (miles)*
White Sea–Baltic	USSR	Barents Sea and Baltic	141
Gota	Sweden	Stockholm and Gothenburg	115
Suez	UAR	Mediterranean and Red Seas	101
Volga–Moscow	USSR	Moscow and Leningrad	80
Albert	Belgium	Antwerp and Liege	80
Volga–Don	USSR	Black and Caspian Seas	62
Kiel	Germany	North and Baltic Seas	61
Houston	USA	Atlantic Ocean and Houston	34
Panama	Panama	Atlantic and Pacific Oceans	51
Elbe	Germany	Magdeburg and Berlin	41
Manchester	England	Mersey Estuary and Manchester	40
Welland*	Canada	Lakes Erie and Ontario	28

Canal	*Country*	*Joining*	*Length (miles)*
Rupel Sea Canal	Belgium	North Sea and Brussels	21
Amsterdam	Netherlands	North Sea and Zuider Zee	16½

* The St. Lawrence Seaway in North America, which is based on the St. Lawrence River, includes the Welland and other canals and is navigable to seagoing ships for a distance of 2,342 miles from Montreal to Lake Erie.

Principal Religions of the World

Christian –		
Roman Catholic	550	(*million members*)
Eastern Orthodox	137	
Protestant	216	
	Total 903	
Muslim (Islam)	433	
Hindu	335	
Confucian	300	
Buddhist	153	
Shinto	51	
Taoist	50	
Jewish	13	

Seven Wonders of the World

The Seven Wonders of Antiquity: 1, The Pyramids of Giza, Egypt: 2, The Hanging Gardens of Semiramis, Babylon, Iraq; 3, The Tomb of King Mausolus of Caria (Halicarnassus, Turkey); 4, The Temple of Diana (Ephesus, Turkey); 5, The Statue of Apollo or Colossus of Rhodes; 6, The Statue of Jupiter (Olympia, Greece); 7, The Lighthouse on Pharos near Alexandria, Egypt.

The Seven Wonders of the Middle Ages: 1, Colosseum of Rome; 2, The Catacombs of Alexandria; 3, The Great Wall of China; 4, Stonehenge; 5, The Leaning Tower of Pisa; 6, The Porcelain Tower of Nanking; 7, The Mosque of St. Sophia (Constantinople, now Istanbul).

The Seven Natural Wonders of the World: 1, The Grand Canyon, Colorado River, Arizona; 2, Rio de Janeiro Harbour, Brazil; 3, Iguassu Falls, Argentina; 4, Yosemite Valley and the Giant Sequoias of California; 5, Mount Everest; 6, The River Nile; 7, The Northern Lights (*Aurora borealis*).

Principal Languages of the World

	(millions)		*(millions)*
Mandarin Chinese	550	Urdu (Pakistan, India)	56
English	305	Cantonese (China)	50
Russian	180	Javanese (Indonesia)	45
Hindi	175	Telugu (India)	45
Spanish	170	Ukrainian	42
German	122	Korean	40
Japanese	100	Min (China)	40
Arabic	90	Tamil (India, Ceylon)	40
Bengali (India, Pakistan)	90	Wu (China)	40
Portuguese	90	Marathi	37
Malay	75	Korean	35
French	73	Polish	34
Italian	60		

Probably more than 2,000 languages are spoken today, many by single tribes and other comparatively small groups. Details of many of these languages have not even been recorded. The 25 languages listed above account for over 80 per cent of the world's population.

Calendars of the World

The Roman Calendar was devised from one supposed to have been invented by Romulus who, according to mythology, founded the city of Rome in 753 B.C. The first Roman year was of 304 days divided into 10 months. Later two more months were added and the year then consisted of 12 months of 29 and 30 days alternately, plus an extra day, making 355 days in all. Since this arrangement did not coincide with a true year (one complete revolution of the Earth round the Sun), the Roman Calendar resulted in much confusion after some hundreds of years, and it gave way to the Julian Calendar.

The Julian Calendar was worked out by Sosigenes, an Egyptian astronomer, and introduced by Julius Caesar in 45 B.C. It fixed the average length of the year at 365¼ days, which resulted in a loss of 11 minutes 10 seconds every year. This loss mounted as hundreds of years went by, again resulting in confusion.

The Gregorian Calendar eventually put the matter right, and it is the Calendar used by nearly all the world today. It was introduced by Pope

Gregory XIII in 1582, and established the year at 365 days 5 hours 49 minutes 12 seconds. England did not adopt the Calendar until 1752, by which time the reckoning by the old Calendar was 11 days too short; thus, when the Gregorian Calendar came into force, 11 days had to be dropped altogether. This led to some trouble because many people thought that they were being robbed of 11 days of life; but eventually everybody settled down to the new way of reckoning.

Leap Year. Our present ordinary calendar year consists of 365 days, with the Leap Year of 366 days accounting for the odd hours, minutes, and seconds. Leap years fall every fourth year, in years which can be divided by 4, except that unless century-years (*i.e.* 1800, 1900, 2000) can be divided by 400 they are not considered as Leap Years.

There are other Calendars which are used for special purposes side by side with the Gregorian Calendar. These are:

The Jewish Calendar, which is calculated from the supposed date of the Creation (set at 3,760 years and 3 months before the birth of Christ). The ordinary Jewish year has 353, 354 or 355 days, and is made up of 12 months. However, to bring the Jewish Calendar into line with the solar year a 13th month is added in some years. The Jewish months have 30 and 29 days alternately, and are called Tishri, Hesvan, Kislev, Tebet, Sebat, Adar, Nisan, Yiar, Sivan, Tamuz, Ab, and Elul; in 13 month years (of 383, 384, or 385 days) an extra 30-day month called Veadar, is inserted after Adar. The Jewish New Year's Day comes some time between September 5 and October 5 in the Gregorian Calendar.

The Muslim Calendar is used in some parts of India, Malaya, Arabia, Persia, and Egypt, and is reckoned from the flight of Muhammad from Mecca to Medina on July 16, A.D. 622 (called the Hejira). The Muslim year has an average length of 354 days 8 hours 48 minutes, and is divided into 12 months of 30 and 29 days alternately. There is a cycle of 30 years, 19 of which have 354 days and 11 have 355 days, the extra day being added to the last month of the year. Since this method of calculation does not correspond to the solar year, months and seasons correspond only once in 34 Muslim years, which period is almost exactly equivalent to 33 solar years.

The Coptic Calendar is used by people in parts of Ethiopia and Egypt, and is of 365 days made up of 12 months of 30 days each plus 5 extra (holiday) days for 3 years and 6 extra days for every 4th (Leap) year.

Dates to Remember Each Year

Movable

Easter Day can fall at any time between March 22 and April 25, it being fixed as the first Sunday after the full moon which happens on or immediately after March 21. Maundy Thursday is the Thursday and Good Friday is the Friday before Easter Day, and the day following Easter Day is a Bank Holiday. Shrove Tuesday (Pancake Day) is the Tuesday and Ash Wednesday is the Wednesday in the seventh week before Easter.

Whit Sunday is the seventh Sunday after Easter, and the day following it was formerly Bank Holiday. Whit Sunday falls between May 10 and June 13. As from 1967 the Whit Monday Bank Holiday has been replaced by the Late Spring Holiday, the date of which is fixed by Parliament.

August Bank Holiday was traditionally the first Monday in August, but since 1966 it has been replaced by the Late Summer Holiday on either the last Monday of August or the first in September.

In some towns and regions (notably Scotland and Northern Ireland) the dates of Bank Holidays are varied by local agreement, particularly if they conflict with local holiday weeks.

Fixed

Jan. 1 – New Year's Day
26 – Foundation Day (Australia)

Feb. 6 – New Zealand Day
14 – St. Valentine's Day

Mar. 1 – St. David's Day
17 – St. Patrick's Day

Apl. 1 – All Fool's Day
21 – The Queen's Birthday
23 – St. George's Day

May 24 – Commonwealth Day

Jun. 2 – Coronation Day (1953)
10 – Prince Philip's Birthday

Jul. 1 – Canada Day
4 – Independence Day (USA)

Aug. 4 – Queen Mother's Birthday

Oct. 21 – Trafalgar Day
24 – United Nations Founded (1945)
31 – All Hallow's Eve

Nov. 14 – Prince of Wales's Birthday
30 – St. Andrew's Day

Dec. 25 – Christmas Day
26 – Boxing Day
31 – New Year's Eve

International Date Line

Places east of Greenwich have times which are fast of Greenwich Mean Time, and places west have times which are slow, the difference being 1 hour for each 15° of longitude (see *World Times at Greenwich Noon* on page 34–5).

On the other side of the world, crossing the Pacific from north to south, there is the meridian of 180° longitude, and it is here that two adjacent days of the calendar meet.

Thus, if two travellers can go so fast that they can reach the 180° meridian from Greenwich in a few seconds, and both start off in opposite directions at midnight on a Thursday, then the one who goes westward (across the Atlantic) will go backwards in time and arrive at 180° some 12 hours earlier by local time; that is, at about noon on Thursday. The other, going eastwards (across Europe and Russia), will go ahead of time and arrive at the same spot some 12 hours later by local time; that is, at noon on Friday. Although they have taken but a few seconds on their respective journeys, there is a day difference between them by calendar when they arrive. Hence it is said that adjacent days meet at 180° longitude.

So that there should be no muddle over this, an International Date Line has been established. For most of its length it follows the 180° meridian, but it varies slightly so that it runs through the middle of the Bering Strait, then to the east of the Aleutian Islands; later it goes westwards of the Fiji, Tonga, and Chatham Islands.

A captain of a ship or aircraft crossing the Date Line puts his calendar back a day when going in an easterly direction, and forward a day when going in a westerly direction.

Summer Time

In Britain, the idea of putting the clock forward one hour during the summer months first took effect in 1916 (during World War I). The

purpose of this arrangement was at first to save power for lighting, and later (in peacetime) to enable people to enjoy longer summer evenings in the open. As an experiment Summer Time was extended in the UK from the day in early spring of 1968 when the clocks were put forward one hour. This meant that the time in the UK was the same as the majority of west European countries all the year round. However, in 1970, after a free vote in Parliament it was decided to return to Greenwich Mean Time, putting the clocks forward for one hour in the summer months only.

Other places adopt systems of Summer Time. Amongst these are: Albania, Azores, Bahamas, British Honduras, Canada (Yukon excepted), China (parts only), Dominican Republic, Formosa, Hong Kong, Iceland, Irish Republic, Italy, Macao, Madeira, Norway, Poland, Portugal, USA (parts only), Syria, Turkey, United Arab Republic, Uruguay.

World Times at Greenwich Noon

Nearly all places in the world have two times – local standard time (which is the time shown on local clocks) and longitude time (the time worked out at the rate of one hour for each 15 degrees of longitude east or west of Greenwich).

The second kind of time is useful mainly to sailors and airmen, who have to know about longitude in order to fix their positions when making voyages and flights. It would not be convenient to use this kind of time on land.

For example, when it is noon at Greenwich it is only 11.40 a.m. (20 minutes earlier) at Falmouth by longitude time. The Falmouth clocks would show noon, however, and so would the clocks in every other place. in the UK, no matter what its longitude. Thus there is no muddle over time in places within the country which are only a few miles apart.

But the UK is small compared with some countries. In the USA, for example, the country is divided into time-zones, and when it is 7 a.m. in New York by the clocks, it is only 4 a.m. in San Francisco (three hours earlier).

The table shows the principal cities of the world in the first column, the local standard (clock) time in the second, and the longitude time in the third, when it is noon at Greenwich. The 24-hour clock is used, and figures less than 12 are a.m., while figures more than 12 are p.m.

Adelaide	21.30	21.14
Aden	15.00	13.1
Algiers	12.00	12.12
Amsterdam	13.00	12.19
Athens	14.00	13.33
Baltimore	7.00	6.44
Belfast	13.00	11.35
Berlin	13.00	12.54
Berne	13.00	12.30
Bombay	17.30	16.51
Boston	7.00	7.15
Brindisi	13.00	13.12
Brisbane	22.00	22.13
Brussels	13.00	12.18
Bucharest	14.00	13.45
Buenos Aires	9.00	8.7
Cairo	14.00	14.5
Calcutta	17.30	17.53
Canton	20.00	19.33
Cape Town	14.00	13.13
Chicago	6.00	6.10
Colombo	17.30	17.13
Concepcion (Chile)	7.00	7.8
Copenhagen	13.00	12.50
Dublin	12.00	11.35
Durban	14.00	14.2
Edinburgh	13.00	11.48
Genoa	13.00	12.36
Gibraltar	13.00	11.29
Guatemala	6.00	5.58
Halifax, Nova Scotia	8.00	7.45
Hamburg	13.00	12.40
Havana	7.00	6.30
Hobart	22.00	21.48
Hong Kong	20.00	19.35
Honolulu	2.00	1.20
Istanbul	14.00	13.56
Karachi	17.00	16.28
Kingston, Jamaica	7.00	6.55
Leningrad	15.00	14.1
Lima	7.00	6.52
Lisbon	12.00	11.24
London	13.00	12.00
Los Angeles	4.00	4.04
Lourenço Marques	14.00	14.12
Madeira	11.00	10.55
Madras	17.30	17.21
Madrid	13.00	11.45
Malta	13.00	12.58
Manila (Philippine Is.)	20.00	20.3
Mecca	14.40	14.40
Melbourne	22.00	21.40
Mexico City	6.00	5.25
Montevideo	9.00	8.15
Montreal	7.00	7.6
Moscow	15.00	14.30
New Orleans	6.00	6.1
New York	7.00	7.4
Odessa	15.00	14.1
Oslo	13.00	12.40
Panama	7.00	6.42
Paris	13.00	12.10
Peking	20.00	20.46
Penang	20.00	18.42
Perth, W.A.	20.00	19.40
Pretoria	14.00	13.54
Quebec	7.00	7.15
Rangoon	18.30	18.20
Rio de Janeiro	9.00	9.8
Rome	13.00	12.50
Salonica	14.00	13.32
San Francisco	4.00	3.50
Santiago	8.00	7.20
Seoul	20.30	20.30
Shanghai	20.00	20.5
Singapore	19.30	18.55
Smyrna	14.00	13.49
Stockholm	13.00	13.12
Suez	14.00	14.11
Sydney	22.00	22.5
Tangier	12.00	11.36
Tokyo	21.00	21.20
Toronto	7.00	6.42

Tripoli	13.00	12.53	Wellington	24.00	23.38
Vancouver	4.00	3.55	Winnipeg	6.00	5.32
Vienna	13.00	13.5			

Where Summer Time applies through part of the year only (see pages 33–4), local clock time is usually one hour ahead of that shown.

Foreign Money

In the table below are shown foreign monetary units (the monetary units of the UK is the £ sterling).

The values of foreign money in relation to that of the UK change somewhat from time to time. A bank will always give the exact day-to-day value of any particular foreign money if asked.

Country	*Monetary Unit*	*Country*	*Monetary Unit*
Argentina	Argentinian Peso	(West)	Deutschemark
Australia	Australian $	Ghana	Cedi
Austria	Schilling	Greece	Drachma
Belgium	Belgian Franc	Guatemala	Quetzal
Bolivia	Bolivian Peso	Haiti	Gourde
Brazil	New Cruzeiro	Honduras	Lempira
Bulgaria	Lev	Hong Kong	HK $
Burma	Kyat	Hungary	Forint
Canada	Canadian $	Iceland	Icelandic Krona
Ceylon		India	Indian Rupee
(Sri Lanka)	Ceylon Rupee	Indonesia	Rupiah
Chile	Chilean Escudo	Iran	Rial
China	People's $	Iraq	Iraqi Dinar
Colombia	Colombian Peso	Israel	Israeli £
Costa Rica	Colon	Italy	Lira
Cuba	Cuban Peso	Japan	Yen
Czechoslovakia	Koruna	Lebanon	Lebanese £
Denmark	Danish Krone	Luxembourg	Luxembourg Franc
Dominican Republic	Dominican Peso	Malaysia	Malaysian $
Ecuador	Sucre	Mexico	Mexican Peso
Finland	Markka	Netherlands	Florin (Guilder)
France	Franc	New Zealand	New Zealand $
Germany		Nicaragua	Cordoba
(East)	Ostmark	Norway	Norwegian Krone

Country	*Monetary Unit*	*Country*	*Monetary Unit*
Pakistan	Pakistan Rupee	Sweden	Swedish Kronor
Panama	Balboa	Switzerland	Swiss Franc
Paraguay	Guarani	Thailand	Baht
Peru	Sol	Turkey	Turkish £
Philippines	Philippine Peso	United Arab Republic	Egyptian £
Poland	Zloty	United States	US $
Portugal	Portuguese Escudo	USSR	Rouble
Rumania	Lev	Uruguay	Uruguayan Peso
Salvador	Colon	Venezuela	Bolivar
South Africa	Rand	Yugoslavia	New Dinar
Spain	Peseta		

Further Reading

Pictorial History of the Ancient World, Ella Anderson (Odhams).
Hamlyn's New Relief World Atlas, Ed. Shirley Carpenter (Paul Hamlyn).
Collins' Pocket Atlas of the World (Collins).
Standard Encyclopedia of the World's Oceans and Islands, Ed. Anthony Huxley (Weidenfeld & Nicolson).
Children's Encyclopedia of Knowledge, Book of Our World (Collins).
The Boys' Book of Engineering Wonders, Leonard Bertin (Burke).

The Commonwealth

The Commonwealth as we know it today comprises the United Kingdom and over 20 independent nations together with a number of small colonies and other non-sovereign territories which are still dependent upon the UK.

This Commonwealth grew out of what used to be called the British Empire – shown as large areas of red on maps of the world printed 25 or more years ago. All the states and territories which are members of the Commonwealth (and others such as Burma and South Africa which

have since left the Commonwealth) used to be governed by men sent out from the UK.

The origins of the Commonwealth date from the voyages of exploration and discovery which started at the end of the fifteenth century and continued for the next 250 years. The first explorers only made passing visits to the newly-found lands, but subsequently people from various European countries went abroad to settle permanently, sometimes seeking refuge from religious persecution. As a result of wars between the European nations, some of these settlements have been in turn colonies of several different countries.

Member countries of the British Empire such as Canada and Australia which had been settled by people of British or European stock were the first to achieve complete self-government and to be independent of the UK, while still being 'united by a common allegiance to the Crown'.

The road to independent nationhood has been a long one particularly for those countries whose populations were not predominantly of British or European descent. Once British rule was firmly established, the Governor usually sought the assistance of local leaders in running the country, some of them being appointed official advisers. Subsequently the Governor would establish a Legislative Council. At first only a few members would be elected, the remainder being appointed by the Governor, but gradually as the Council gained experience in governing the country, the people would elect more and more members.

Although the details of its power vary from colony to colony, the Legislative Council is usually only responsible for the colony's internal affairs, with the UK Parliament looking after foreign affairs. Eventually, when the Legislative Council has shown that it is able to govern the colony fairly, the country can apply to become fully independent. It can also decide whether it wishes to remain in the Commonwealth after gaining independence. Some Commonwealth countries, such as India, Pakistan and Ghana have chosen to be republics, although all Commonwealth countries recognize the Queen as Head of the Commonwealth.

The Commonwealth is a very special form of association of countries. It has no single parliament or government, no central defence force, neither has it a common foreign policy. Formal relationships within the Commonwealth depend largely upon consultation, the most import-

ant form of consultation being the conference of Commonwealth Prime Ministers which is held at least every second year.

However, there are many informal bonds linking the member nations as a family of independent states, some of which result from the original settlers from Britain taking British culture, traditions, sports and the English language with them. So many different languages and dialects are spoken in some of the newly independent Commonwealth countries that English is the only language in which the countries' leaders can speak to their people. Imperial preferences (special reduced customs duties for the import of goods from one Commonwealth country to another) encourage trade between member nations. In the field of sport, cricket and cricketing language are familiar in Australia, England, India, New Zealand, Pakistan and the West Indies, but hardly known outside the Commonwealth.

Independent Nations Within the Commonwealth

Nation	*Became British Territory in**	*Date of Independence‡*
Australia (federation of former colonies)		1901
Bangla Desh		1972
Barbados	1652	1966
‡Botswana (formerly Bechuanaland)	1885	1966
Canada (federation of former colonies)		1867
Ceylon (Sri Lanka)	1802	1948
‡Cyprus	1878	1960
Fiji	1840	1970
The Gambia	1843	1965
‡Ghana (formerly Gold Coast)	1874	1957
‡Guyana (formerly British Guiana)	1831	1966
‡India	1757	1947
Jamaica	1655	1962
‡Kenya	1887	1963
‡Lesotho (formerly Basutoland)	1868	1966
‡Malawi (formerly Nyasaland)	1889	1964
‡Malaysia (federation of former Malay states)		1963
Malta	1800	1964
Mauritius	1810	1968
‡Nauru (special membership)	1914	1968
New Zealand	1840	1907
‡Nigeria	1862	1960
‡Pakistan (formerly part of Indian Empire)		1947
Sierra Leone	1863	1961

Nation	*Became British Territory in**	*Date of Independence†*
‡Singapore	1867	1965
Swaziland	1881	1968
‡Tanzania (formerly Tanganyika and Zanzibar)	1919	1962
Tonga	1900	1970
Trinidad and Tobago	1802	1962
‡Uganda	1888	1962
W. Samoa	1840	1970
Zambia (formerly Northern Rhodesia)	1889	1964

* Dates given are either those of the commencement of continuous British rule or of the foundation of the British Crown Colony.

† Date of gaining independence of the UK. Nations which are now republics within the Commonwealth – denoted by a double dagger‡ – may have taken republican status at a later date.

Crown Colonies and Other Non-Sovereign Territories Administered by the UK

The trend towards full independent nationhood has substantially reduced the number of colonies and non-sovereign territories. Some of the countries administered by the UK listed below are well advanced in achieving self-government, while others are small island communities which would have difficulty in surviving as fully independent states.

Antigua
Bahamas
Bermuda
British Antarctic Territory
British Honduras
British Indian Ocean Territory
British Virgin Islands
Brunei
Cayman Islands
Dominica
Falkland Islands and Dependencies
Gibraltar
Grenada
Hong Kong
Montserrat
Pitcairn Islands
Rhodesia§
St. Helena¶
St. Kitts-Nevis
St. Lucia
St. Vincent
Seychelles
Turks and Caicos Islands
Western Pacific High Commission||

§ Illegally declared independent in November 1965.

¶ Includes Ascension and Tristan da Cunha.

|| Includes British Solomon Islands, Central and Southern Line Islands, Gilbert and Ellice Islands, Canton and Enderbury Islands and the Anglo French Condominium of the New Hebrides.

Monarchs of Britain

Until 1301, Wales was considered as one or more independent kingdoms having its own sovereign. In that year the son of Edward I of England was created Prince of Wales, and in 1307 he became King of England and Wales.

Before the Union of the Crowns of England and Scotland in 1603, Scotland was also an independent kingdom.

And before the year 827, England itself was not a united country, but had separate kings for such regions as Wessex, Mercia, and Northumbria. In 827 there ascended to the throne the 'first King of all the English' – Egbert the Great, King of Wessex, who subdued the other kingdoms except Northumbria and Cumbria mainly by force.

His immediate successors exercised direct rule over much of England for intermittent periods during their reigns, but England (excluding Cumbria) did not finally become a united kingdom until 954 in the reign of Edred.

In the following tables of sovereigns the dates given are those on which the respective rulers began their reigns.

English Kings (829–1603)

Name	*Descent*	*Came to Throne*
Saxon		
Egbert the Great		827
Ethelwulf	Son of Egbert the Great	839
Ethelbald and Ethelbert	Sons of Ethelwulf	858
Ethelred I	Third son of Ethelwulf	866
Alfred the Great	Fourth son of Ethelwulf	871
Edward the Elder	Son of Alfred the Great	901
Athelstan	First son of Edward the Elder	925
Edmund I the Elder	Third son of Edward the Elder	940
Edred	Fourth son of Edward the Elder	946
Edwy	First son of Edmund	955
Edgar the Peaceable	Second son of Edmund	959
Edward the Martyr	First son of Edgar	975
Ethelred II the Unready	Second son of Edgar	978
Edmund II (Ironside)	Third son of Ethelred	1016

Name	*Descent*	*Came to Throne*
Danish		
Canute	(By conquest)	1017
Harold I	Son of Canute	1035
Hardicanute	Son of Canute	1040
Saxon		
Edward the Confessor	Son of Ethelred II	1042
Harold II	Brother of Edith, wife of Edward the Confessor	1066
Norman		
William I of Normandy	(By conquest)	1066
William II	Third son of William I	1087
Henry I	Fourth son of William I	1100
Stephen	Grandson of William I	1135
Plantagenet		
Henry II	Grandson of Henry I	1154
Richard I	Third son of Henry II	1189
John	Fifth son of Henry II	1199
Henry III	Eldest son of John	1216
Edward I	Elder son of Henry III	1272
England and Wales		
Edward II	Fourth son of Edward I	1307
Edward III	Elder son of Edward II	1327
Richard II	Grandson of Edward III	1377
Lancaster		
Henry IV	Grandson of Edward III	1399
Henry V	Second son of Henry IV	1413
Henry VI	Son of Henry V	1422
York		
Edward IV	Great-grandson of Edward III	1461
Edward V	Elder son of Edward IV	1483
Richard III	Brother of Edward IV	1483
Tudor		
Henry VII	Son of Edmund Tudor and Margaret Beaufort, great-great-grand-daughter of Edward III	1485

Name	*Descent*	*Came to Throne*
Henry VIII	Second son of Henry VII	1509
Edward VI	Son of Henry VIII	1547
Jane	Grand-daughter of Mary, sister of Henry VIII	1553
Mary I	Daughter of Henry VIII	1553
Elizabeth I	Daughter of Henry VIII	1558

Kings of Great Britain (from 1603)

Stuart		
James I	(King James VI of Scotland)	1603
Charles I	Second son of James I	1625–49
(Here came Oliver Cromwell, 1653–8, and Richard Cromwell,		1658–9)
Charles II	Second son of Charles I	1660
James II	Third son of Charles I	1685
William III	Son of William of Orange and Mary, daughter of Charles I	1689
Mary II	Eldest daughter of James II	
Anne	Daughter of James II	1702
Hanover		
George I	Son of Ernest Augustus, First Elector of Hanover and Sophia, grand-daughter of James I	1714
George II	Son of George I	1727
George III	Grandson of George II	1760
George IV	Eldest son of George III	1820
William IV	Third son of George III	1830
Victoria	Grand-daughter of George III	1837
Saxe-Coburg		
Edward VII	Eldest son of Victoria	1901
Windsor		
George V	Second son of Edward VII	1910
Edward VIII	Eldest son of George V	1936
George VI	Second son of George V	1936
Elizabeth II	Elder daughter of George VI	1952

Kings of Scotland (1005 – 1603)

Malcolm II	1005	Margaret	1286–90
Duncan I	1034	John Balliol	1292–96
Macbeth	1040	Robert I (the Bruce)	1306
Malcolm III	1057	David II	1329
Donald Bane	1093	Robert II	1371
Duncan II	1094	Robert III	1390
Donald Bane (restored)	1094	James I	1406
Edgar	1097	James II	1437
Alexander I	1107	James III	1460
David I	1124	James IV	1488
Malcolm IV	1153	James V	1513
William (the Lion)	1165	Mary	1542
Alexander II	1214	James VI	1567
Alexander III	1249		

(James VI of Scotland became James I of England in 1603.)

The British Constitution

The Crown, which consists of the Queen at the head of the High Court of Parliament, is the responsible authority of Central Government. The Queen opens Parliament every year by making a speech from the Throne in the House of Lords, and thereafter she conducts the day-to-day business of State through her Privy Council. The Queen entrusts executive duties to her Ministers.

The Cabinet is formed of the Ministers of the Crown, and usually consists of 24 Ministers, not more than 22 of whom may be Members of the House of Commons. There may also be 27 Parliamentary Secretaries, of whom not more than 23 may be Members of the House of Commons, and not less than 4 must be Members of the House of Lords. The head of the Cabinet is the Prime Minister, who is appointed by the Queen.

The House of Lords consists of royal princes, archbishops, dukes, marquesses, earls, countesses in their own right, viscounts, bishops, barons, baronesses in their own right, law lords, life peers and life peeresses; it is presided over by the Lord High Chancellor. The right to sit in the House of Lords is governed by elevation to a peerage or by

birth. In 1958, peeresses became eligible to sit in the House of Lords for the first time in history.

The House of Lords forms a Court of Appeal (the highest in the land), which consists of 7 law lords and some others who have held legal appointments. The decisions of this Court become law.

The House of Commons consists of 630 citizens who have been elected as Members of Parliament by their fellow-citizens. Its proceedings are governed by rules called Standing Orders, and directed by a chairman (called the Speaker) who is elected by the Members themselves. The House of Commons as elected at a General Election may continue in office for a maximum of five years, after which Parliament is declared dissolved and there has to be another General Election.

In theory no Member of the House of Commons may resign, but he must cease to be a Member when he is appointed to an office under the Crown: in order to resign he applies for the Stewardship of the Chiltern Hundreds or of the Manor of Northstead in Yorkshire. Although neither appointment carries duties or salary, it is an office under the Crown, hence anyone appointed to it is no longer allowed to be a Member.

Nearly all Members of the House of Commons belong to one or other of the political parties of the day, and when, after a General Election, one party is found to have more Members elected to the House than any other, that party forms the Government. From it the Queen appoints her Prime Minister, and the Prime Minister appoints other Ministers, some of whom form the Cabinet.

The Government will remain in office until, by vote, it is defeated in the House on some important issue; it is then called upon to resign its powers, which may be taken up by the next largest party. Alternatively, if the next party feels it is likely to be defeated by vote very soon after it forms a Government, the Prime Minister advises the Queen to dissolve Parliament, and there has to be a General Election, even if five years have not elapsed since the last General Election.

How Our Laws Are Made

One of the most important functions of Parliament is to make laws whereby the country's affairs may be regulated. While any proposed law is being discussed and shaped, it is called a Bill; when it finally receives the Queen's Assent, it becomes an Act of Parliament.

A Bill may be drafted and introduced either by the Government or by any Member of either House. Most Bills are introduced in the House of Commons, where they go through the following stages:

First Reading. The Bill is formally introduced in the House, and ordered to be printed so that everyone shall know its contents.

Second Reading. The Minister or other Member who introduced it explains the principles of the Bill and the House usually debates it and then decides, often by vote, whether it shall go any further. If the supporters of the Bill are in the majority, the Bill goes to –

Committee, where it is examined closely, clause by clause and word by word, and altered or 'amended'.

Report Stage. After the Committee has reported to the House, further amendments may be made by the House.

Third Reading. The Bill, as amended, is discussed by the House, and accepted or rejected as a whole. If it is accepted, it goes to the House of Lords, where it passes through procedure similar to that described above.

The House of Lords may accept, amend, or reject the Bill – unless it is a Finance Bill (which contains the Budget proposals) or any other Bill certified by the Speaker to be a 'Money' Bill. Since 1911, the Lords has by law had to pass such Bills without amendment.

A Bill passed by the Lords without amendment is ready for the Royal Assent, which is signified by Commissioners who act for the Queen. If it is amended it goes back to the House of Commons for the amendments to be considered; and if the Commons agrees to the amendments, the Bill is ready for the Royal Assent.

If the Lords rejects a Bill introduced in the Commons, it cannot be put forward for Royal Assent. If, however, the House of Commons passes a Bill in two successive Sessions and the House of Lords rejects it each time, the Bill goes forward for Royal Assent provided that there is a year's interval between the Second Reading in the Commons in the first Session and the Third Reading in the Commons in the second Session.

Britain's Prime Ministers

The official residence of the Prime Minister of the day is No. 10 Downing Street, just off Whitehall in London. His country residence is Chequers, near Aylesbury in Buckinghamshire.

The Prime Ministers, from Sir Robert Wapole (who is generally considered to have been the first), are as follows:

Prime Minister	*Party*	*Date*
Sir Robert Walpole	Whig	1721
Earl of Wilmington	Whig	1742
Henry Pelham	Whig	1743
Duke of Newcastle	Whig	1754
Duke of Devonshire	Whig	1756
Duke of Newcastle	Whig	1757
Earl of Bute	Tory	1762
George Grenville	Whig	1763
Marquess of Rockingham	Whig	1765
Earl of Chatham	Whig	1766
Duke of Grafton	Whig	1767
Lord North	Tory	1770
M. of Rockingham	Whig	1782
Earl of Shelburne	Whig	1782
Duke of Portland	C.	1783
William Pitt*	Tory	1783
Henry Addington	Tory	1801
William Pitt*	Tory	1804
Lord Grenville	Whig	1806
Duke of Portland	Tory	1807
Spencer Perceval	Tory	1809
Earl of Liverpool	Tory	1812
George Canning	Tory	1827
Viscount Goderich	Tory	1827
Duke of Wellington	Tory	1828
Earl Grey	Whig	1830
Viscount Melbourne	Whig	1834
Duke of Wellington	Tory	1834
Sir Robert Peel	Cons.	1834
Vct. Melbourne	Whig	1835
Sir Robert Peel	Cons.	1841
Lord John Russell	Whig	1846
Earl of Derby	Tory	1852
Earl of Aberdeen	Peelite	1852
Vct. Palmerston	Lib.	1855
Earl of Derby	Cons.	1858
Vct. Palmerston	Lib.	1859
Earl Russell	Lib.	1865
Earl of Derby	Cons.	1866
Benjamin Disraeli	Cons.	1868
W. E. Gladstone	Lib.	1868
Benjamin Disraeli	Cons.	1874
W. E. Gladstone	Lib.	1880
Marquess of Salisbury	Cons.	1885
W. E. Gladstone	Lib.	1886
M. of Salisbury	Cons.	1886
W. E. Gladstone	Lib.	1892
Earl of Rosebery	Lib.	1894
M. of Salisbury	Cons.	1895
A. J. Balfour	Cons.	1902
Sir H. Campbell-Bannerman	Lib.	1905
H. H. Asquith	Lib.-C	1908
D. Lloyd George	C.	1916
A. Bonar Law	Cons.	1922
S. Baldwin	Cons.	1923
J. R. Macdonald	Lab.	1924
S. Baldwin	Cons.	1924
J. R. Macdonald	Lab.-C	1929
S. Baldwin	C.	1935
N. Chamberlain	C.	1937
Winston Churchill	C.	1940

Prime Minister	*Party*	*Date*	*Prime Minister*	*Party*	*Date*
C. R. Attlee	Lab.	1945	Sir Alexander Douglas-Home	Cons.	1963
Sir Winston Churchill	Cons.	1951	J. H. Wilson	Lab.	1964
Sir Anthony Eden	Cons.	1955	E. R. G. Heath	Cons.	1970
H. Macmillan	Cons.	1957			

Note: Cons. = Conservative; C. = Coalition; Lib. = Liberal; Lab. = Labour.

* William Pitt, the Younger, son of the Earl of Chatham (William Pitt, the Elder).

Highest Mountains of the UK

	County	*Height (feet)*
Scotland		
Ben Nevis	Inverness-shire	4,406
Ben Macdhui	Aberdeenshire/Banffshire	4,300
Braeriach	Aberdeenshire/Inverness-shire	4,248
Cairn Toul	Aberdeenshire	4,241
Cairngorm	Banffshire/Inverness-shire	4,084
Wales		
Snowdon	Caernarvonshire	3,560
Carnedd Llewelyn	Caernarvonshire	3,484
Carnedd Dafydd	Caernarvonshire	3,426
Glyder Fawr	Caernarvonshire	3,279
Glyder Fach	Caernarvonshire	3,262
England		
Scafell Pike	Cumberland	3,210
Scafell	Cumberland	3,162
Helvellyn	Cumberland/Westmorland	3,118
Skiddaw	Cumberland	3,053
Bow Fell	Cumberland/Westmorland	2,960
Northern Ireland		
Slieve Donard	Co. Down	2,796

Longest Rivers of the UK

River	*Source*	*Mouth*	*Length (miles)*
Severn	Plinlimmon, Montgomeryshire	Bristol Channel	220
Thames	Cotswold Hills, near Cirencester, Glos.	North Sea	210
Trent	Biddulph Moor, Staffs.	Joins Yorkshire Ouse (45 miles) to form Humber (38 miles)	147
Great Ouse	Brackley, Northants.	The Wash	143
Wye	Plinlimmon, Montgomeryshire	Joins Severn near Chepstow	135
Tay	Beinn Oss, Perthshire	Firth of Tay	117
Nene	Naseby, Northants.	The Wash	100
Clyde	Earncraig, Lanarkshire	Firth of Clyde	98·5
Spey	Loch Spey, Inverness-shire	Moray Firth	98·0
Tweed	Tweedsmuir Hills, Peebleshire	North Sea	96·5

Principal Lakes of the UK

Name	*County*	*Area (sq. miles)*
Northern Ireland		
Lough Neagh	Antrim, Armagh, Down, Londonderry, Tyrone	147
Lower Lough Erne	Fermanagh	40·5
Upper Lough Erne	Cavan/Fermanagh	12·25
Scotland (freshwater, inland lochs)		
Loch Lomond	Dunbartonshire/Stirlingshire	27·5
Loch Ness	Inverness-shire	22
Loch Awe	Argyll	15
Loch Maree	Ross and Cromarty	11
Loch Morar	Inverness-shire	10·3
England		
Lake Windermere	Lancs./Westmorland	5·69
Ullswater	Cumberland/Westmorland	3·44
Bassenthwaite Water	Cumberland	2·06

Name	*County*	*Area (sq. miles)*
Derwentwater	Cumberland	2·06
Coniston Water	Lancs.	1·89
Wales		
Bala Lake	Merionethshire	3·69
Lake Vyrnwy (dammed)	Montgomeryshire	3·18

Insignia of Rank of the UK Armed Forces

Equivalent ranks in the three services.

Royal Navy	*Army*	*Royal Air Force*
Admiral of the Fleet	Field Marshal	Marshal of the RAF
Admiral	General	Air Chief Marshal
Vice-Admiral	Lieut.-General	Air Marshal
Rear-Admiral	Major-General	Air Vice-Marshal
Commodore	Brigadier	Air Commodore
Captain	Colonel	Group Captain
Commander	Lieut.-Colonel	Wing Commander
Lieut.-Commander	Major	Squadron Leader
Lieutenant	Captain	Flight Lieutenant
Sub-Lieutenant	Lieutenant	Flying Officer
Warrant Officer	Second Lieutenant	Pilot Officer

The Insignia in Fig. 1 opposite are in the same order as in above lists.

British Flags

The Royal Standard of the United Kingdom is the personal flag of Her Majesty, and may be flown only when she is actually present in a building. It must never be flown when she is passing in procession. The flag is divided into 4 quarters. The 1st and 4th quarters each contains the three lions *passant* of England, the 2nd quarter contains the lion *rampant* of Scotland, while the 3rd quarter contains the harp of Ireland.

The Union Flag of the United Kingdom, more generally known as The Union Jack, is the flag which may be flown by all Her Majesty's subjects. It was introduced in 1606 following the union of England and Scotland, and took its present form in 1801 following the Union with Ireland. It now contains in one design the red cross (on white) of St. George (patron saint of England), the white diagonal cross (on blue) of Saint Andrew (patron saint of Scotland), and the red diagonal cross (on white) of St

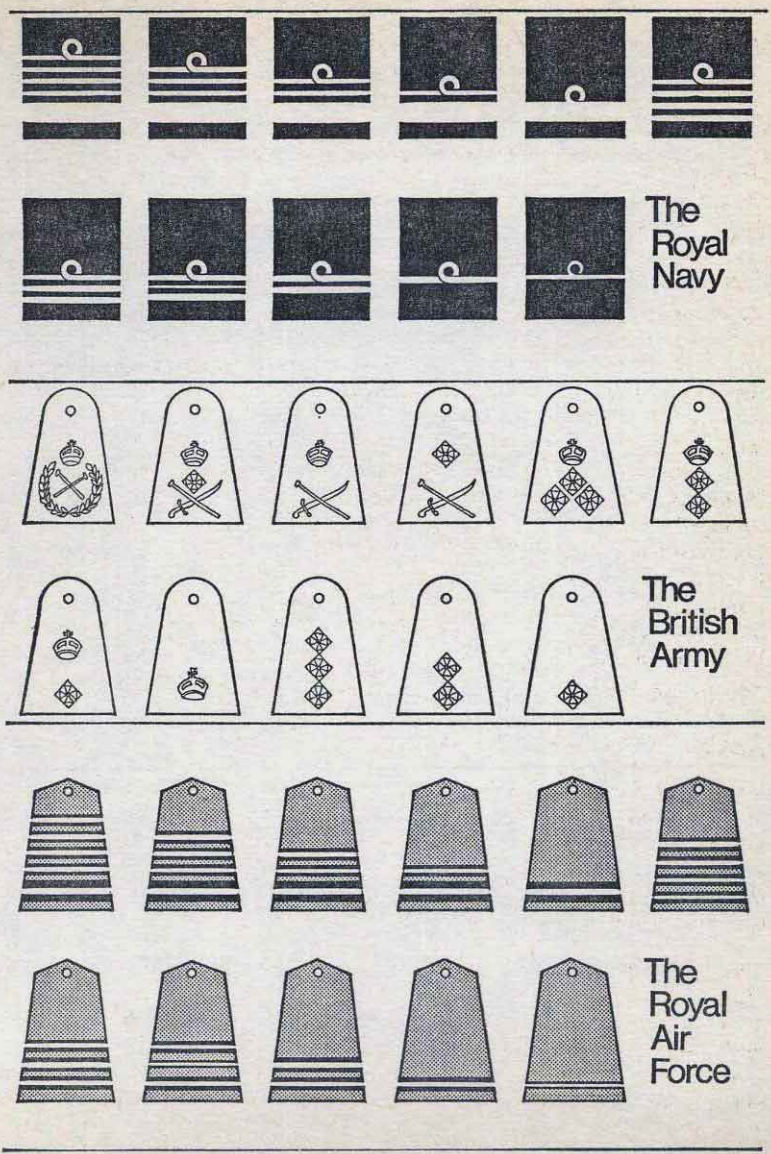


Fig. 1. Insignia of rank of the UK Armed Forces

Patrick (patron saint of Ireland). The Union Jack is flown correctly when the larger strips of white next to the flagstaff are uppermost.

The White Ensign is the flag of the Royal Navy and the Royal Yacht Squadron. It consists of a white flag bearing the cross of St. George, with a small Union Jack in the top corner next to the flagstaff.

The Red Ensign is the flag flown by all British merchant vessels not belonging to the Royal Navy. It is a plain red flag with the Union Jack in the top quarter next to the flagstaff, and is known amongst sailors as 'the red duster'.

The Blue Ensign is the flag of the Royal Naval Reserve and of certain yacht clubs whose names are shown in the Navy List. It is similar to the Red Ensign, but with the background colour blue.

Further Reading

Children's Encyclopedia of Knowledge, Book of History (Collins).
A Pageant of History (Collins).
The Pictorial History Book (Sampson Low).
People in History, R. J. Unstead (Black).
No. 10 Downing Street: A House of History, R. J. Minney (Cassell).
Britain and Her People. A Story of a Country and its People, their history, traditions and achievements (Ward, Lock).
Scotland and Her People, Freda M. Buchanan (Lutterworth).

Science and Mathematics

Experiment is the key to our knowledge of the world around us, what it is made of and how various materials behave. Scientists have found out all that they know about the composition and behaviour of materials by carrying out experiments, working out theories and then putting their theories to the test in more experiments.

For many of us the chance of carrying out experiments – whether they are going to produce gases that stink or merely to find out the density of a lump of metal by weighing it and measuring its volume – is the feature which attracts us most of all to studying science.

Unfortunately, there is not enough space here to give details of any experiments, but that is not the purpose of the book. Rather it sets out

to give lists and tables of facts with just sufficient explanation to give the facts some meaning. However, the lists of books for further reading at the end of the chapter includes some which give details of experiments.

Inventions and Discoveries

Achievement	*Date*	*Inventor/Discoverer*
Adding Machine	1642	Blaise Pascal (French)
Arc Lamp	1879	C. F. Brush (US)
Aspirin	1893	Hermann Dreser
Bakelite	1907	Leo H. Baekeland (Belgian/US)
Barometer	1643	Evangelista Torricelli (Italian)
Bifocal lens	1780	Benjamin Franklin (US)
Bunsen burner	1855	Robert von Bunsen (German)
Carbon dioxide and gases generally	1848	Johann Baptista van Helmont (Belgian)
Celluloid	1861	Alexander Parkes (British)
Cement (Portland)	1824	Joseph Aspdin (British)
Chronometer	1735	John Harrison (British)
Clock (mechanical)	725	I-Hsing and Liang Ling-Tsan (Chinese)
Clock (pendulum)	1657	Christian Huygens (Dutch)
Combustion (Theory of)	1775	Antoine Lavoisier (French)
DDT	1939	Paul Müller (Swiss)
Dyes (synthetic)	1857	William Perkins (British)
Dynamo	1860	Antonio Picinotti (Italian)
Electric generator (static)	1660	Otto von Guericke (German)
Electric lamp	1879	Thomas Edison (US)
Electric motor (d.c.)	1873	Zénobe Gramme (Belgium)
(a.c.)	1888	Nikola Tesla (US)
Electro magnet	1824	William Sturgeon (British)
Electrometer	1788	Alessandro Volta (Italian)
Electronic computer	1942	J. G. Brainerd, J. P. Eckert, J. W. Manchly (USA)
Fluorine	1771	Wilhelm Scheele (Swedish)
Gravity	1682	Isaac Newton (British)
Gyro compass	1911	Elmer Sperry (US)
Hydrogen	1766	Henry Cavendish (British)
Laser	1960	Charles Towney (US)
Light (Wave theory of)	1690	Christian Huygens (Dutch)
Logarithms	1614	John Napier (Scots)
Magnetism	1600	William Gilbert (English)

Achievement	*Date*	*Inventor/Discoverer*
Margarine	1863	Hippolyte Mège-Mouries (French)
Microphone	1876	Alexander Graham Bell (US)
Microscope	1590	Zacharias Jansen (Dutch)
Microscope (electron)	1939	Vladimir Zworykin (Russian/US)
Morphine	1805	Friedrich Sertürner (German)
Nitrogen	1772	Daniel Rutherford (British)
Nylon	1937	Wallace Carothers (US)
Oxygen	1774	Joseph Priestley (British) Wilhelm Scheele (Swedish)
Pendulum	1602	Galileo Galilei (Italian)
Photography (on metal)	1826	J. Nicéphore Niépce (French)
Penicillin	1940	Alexander Fleming (British)
Radar	1935	Robert Watson-Watt (British)
Radio telegraphy	1895	Guglielmo Marconi (Italian)
Radium	1898	Pierre and Marie Curie (French)
Rare gases	1894–8	William Ramsey (British)
Rayon	1883	Joseph Swan (British)
Rubber (latex foam)	1928	E. A. Murphy (British)
Rubber (vulcanized)	1841	Charles Goodyear (US)
Silicones	1904	F. S. Kipping (British)
Slide rule	1621	William Oughtred (British)
Sodium	1807	Humphry Davy (British)
Steel production	1855	Henry Bessemer (British)
Telegraph	1837	William Coke, Charles Wheatstone (British)
Telephone	1861	J. Philip Reis (German)
Telescope	1608	Hans Lippershey (Dutch)
Television	1926	John Logie Baird (British)
Terylene	1941	J. R. Whinfield, J. T. Dickson (British)
Thermometer	1593	Galileo Galilei (Italian)
Transistor	1948	Walter Brittain (US)
Vitamins	1930	Frederick Hopkins (British)
X-rays	1895	Wilhelm von Röntgen (German)

Basic Laws of Physics and Chemistry

Archimedes' Principle. Floating objects and objects which are completely submerged in a liquid experience an upthrust equal to the weight of liquid displaced by the object.

Avogadro's Law. Equal volumes of all gases under the same conditions of temperature and pressure contain the same number of molecules.

Boyle's Law. The volume of a given quantity (mass) of any gas varies inversely as the pressure acting upon it, provided that the temperature of the gas remains unchanged.

Charles' Law. The volume occupied by a given quantity (mass) of gas is directly proportional to its absolute temperature, provided that the pressure of the gas remains unchanged.

Law of Constant Composition. A definite chemical compound always contains the same elements chemically combined in the same proportions by weight.

Law of Conservation of Mass. In all ordinary chemical reactions the total mass of the reactants is always equal to the total mass of the products, which is another way of saying that matter can neither be created nor destroyed.

Law of Conservation of Energy. Except in thermonuclear reactions, energy can neither be created nor destroyed; it is merely transformed from one form to another.

Faraday's Laws of Electrolysis. (1) The weight of an ion formed or deposited at an electrode is proportional to the quantity of electricity (number of coulombs) which is passed through the electrolyte. (2) The weights of ions formed or deposited by the same quantity of electricity are in the ratio of their chemical equivalents.

The Gas Law. Changes in the volume (V) of a gas as its pressure (P) and absolute temperature (T) are varied may be predicted by the equation $PV = RT$, where R is a constant. This relationship, which is not followed exactly under extremes of temperature or pressure is a combination of Boyle's and Charles' laws.

Graham's Law of Diffusion. The relative rates of diffusion of different gases under identical conditions are inversely proportional to the square roots of their densities.

Hooke's Law. Provided the elastic limit is not exceeded, the extension of an elastic spring is proportional to the force producing the extension.

Law of Multiple Proportions. When two elements combine to form more than one compound, the weights of the first element which combine separately with a fixed weight of the second are in the ratio of whole numbers, usually small.

Newton's Laws of Motion.
(1) Every body continues in a state of rest or of uniform motion in a straight line unless it is compelled by an external force to change that state.

(2) Rate of change of momentum is proportional to the applied force and takes place in the direction in which the force acts.

(3) To every action there is an equal and opposite reaction.

Ohm's Law. Providing its physical conditions (*e.g.* its temperature) do not alter, the current flowing through a wire is directly proportional to the potential difference between the ends of the wire.

Theorem of Parallelogram of Forces. If two forces acting at a point are represented in size and direction by the two sides of a parallelogram drawn from a point, the resultant of the two forces is represented in size and direction by the diagonal of the parallelogram drawn from that point.

Law of Reciprocal Proportions. Elements combine with one another to form compounds in the ratio of their chemical equivalents, or in some simple multiple or sub-multiple of that ratio.

Laws of Reflection.
(1) The incident ray, the reflected ray and the normal to the reflecting surface at the point of incidence lie in the same plane.

(2) The angle between the incident ray and the normal (*i.e.* the angle of incidence) is equal to the angle between the reflected ray and the normal.

Snell's Laws of Refraction.
(1) The incident ray, the refracted ray and the normal to the surface separating the two media at the point of incidence lie in the same plane.

(2) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for any pair of media.

Laws of Thermodynamics.

(0) If two objects are in thermal equilibrium with a third object, then they are in thermal equilibrium with each other.

(1) Heat and mechanical work are mutually convertible, and in any operation involving such a conversion one calorie of heat is equivalent to $4{\cdot}18 \times 10^{-7}$ ergs of mechanical work.

(2) Heat cannot be transferred from a colder to a hotter body by a continuous, self-sustaining process, *i.e.* heat cannot flow 'uphill' of its own accord.

(3) It is impossible to cool matter down to the absolute zero of temperature.

Useful Formulae in Physics

Mechanics

Equations of Motion

$$v = u + at \qquad s = \frac{u + v}{2} t$$

$$s = ut + \tfrac{1}{2}at^2 \qquad v^2 = u^2 + 2as$$

where a = acceleration, u = initial velocity, v = final velocity, s = distance, t = time

Pendulum

$$t = 2\pi \sqrt{\frac{l}{g}}$$

where t = time of one complete swing (once in each direction), l = length of pendulum, g = acceleration due to gravity

Machines

$$\text{mechanical advantage} = \frac{\text{load}}{\text{effort}}$$

$$\text{velocity ratio} = \frac{\text{distance moved by effort}}{\text{distance moved by load}}$$

$$\text{efficiency} = \frac{\text{work done by machine}}{\text{energy put into machine}} = \frac{\text{mechanical advantage}}{\text{velocity ratio}}$$

Mirrors and Lenses

$$\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$$

where u = distance of object from mirror or lens
v = distance of image from mirror or lens
f = focal length of mirror or lens (for convex mirrors and concave lenses f is negative).

(Distances from mirror/lens to real objects/images are positive and to virtual objects/images negative.)

In all the above formulae the value of one remaining unknown can be found by substituting appropriate value of all the other quantities. **Always take care to use the same units throughout:** *for instance, do not mix times in minutes with speeds in miles per hour in the equations of motion (it is usually best to convert times to seconds).*

Electricity

Ohm's Law

$$E = IR \qquad R = \frac{E}{I} \qquad I = \frac{E}{R} \qquad W = IE = I^2R = \frac{E^2}{R}$$

where E = potential difference (in volts), I = current (in amperes), R = resistance (in ohms), and W = power (in watts).

Resistances

$$\text{in series, } R = R_1 + R_2 + R_3, \text{ etc.}$$

$$\text{in parallel, } \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}, \text{ etc.}$$

where R = resistance (in ohms).

Capacitors

$$\text{in series, } \frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}, \text{ etc.}$$

$$\text{in parallel, } C = C_1 + C_2 + C_3, \text{ etc.}$$

where C = capacity (in farads or in microfarads).

Frequency and Wavelength

$$n = \frac{300{,}000}{\lambda}, \text{ and } \lambda = \frac{300{,}000}{n}$$

where n = frequency (in kiloHertz) and λ = wavelength (in metres).

Table of Elements

Over 100 chemical elements have now been identified by scientists. Of these, 88 are known to occur in nature either by themselves or in combination with other elements. The remainder have been produced artificially, either as a result of radio-active decay or through nuclear bombardment. The table lists the chemical symbol, atomic number and atomic weight of all known elements.

Element	*Symbol*	*At. No.*	*At. Wt.*
Actinium	Ac	89	[227]
Aluminium	Al	13	27·0
Americium	Am	95	[243]
Antimony	Sb	51	121·8
Argon	Ar	18	39·9
Arsenic	As	33	74·9
Astatine	At	85	[210]
Barium	Ba	56	137·3
Berkelium	Bk	97	[249]
Beryllium	Be	4	9·0
Bismuth	Bi	83	209·0
Boron	B	5	10·8
Bromine	Br	35	79·9
Cadmium	Cd	48	112·4
Caesium	Cs	55	132·9
Calcium	Ca	20	40·1
Californium	Cf	98	[251]
Carbon	C	6	12·0
Cerium	Ce	58	140·1
Chlorine	Cl	17	35·5
Chromium	Cr	24	52·0
Cobalt	Co	27	58·9
Copper	Cu	29	63·5
Curium	Cm	96	[247]
Dysprosium	Dy	66	162·5
Einsteinium	Es	99	[254]
Erbium	Er	68	167·3
Europium	Eu	63	152·0
Fermium	Fm	100	[253]
Fluorine	F	9	19·0
Francium	Fr	87	[223]

Element	*Symbol*	*At. No.*	*At. Wt.*
Gadolinium	Gd	64	157·3
Gallium	Ga	31	69·7
Germanium	Ge	32	72·6
Gold	Au	79	197·0
Hafnium	Hf	72	178·5
Helium	He	2	4·0
Holmium	Ho	67	164·9
Hydrogen	H	1	1·0
Indium	In	49	114·8
Iodine	I	53	126·9
Iridium	Ir	77	192·2
Iron	Fe	26	55·8
Krypton	Kr	36	83·8
Kurchatovium	Ku	104	[260]
Lanthanum	La	57	138·9
Lawrencium	Lw	103	[257]
Lead	Pb	82	207·2
Lithium	Li	3	6·9
Lutetium	Lu	71	175·0
Magnesium	Mg	12	24·3
Manganese	Mn	25	54·9
Mendelevium	Md	101	[256]
Mercury	Hg	80	200·6
Molybdenum	Mo	42	95·9
Neodymium	Nd	60	144·2
Neon	Ne	10	20·2
Neptunium	Np	93	[237]
Nickel	Ni	28	58·7
Niobium	Nb	41	92·9
Nitrogen	N	7	14·0
Nobelium	No	102	[254]

Element	Symbol	At. No.	At. Wt.	Element	Symbol	At. No.	At. Wt.
Osmium	Os	76	190·2	Silver	Ag	47	107·9
Oxygen	O	8	16·0	Sodium	Na	11	23·0
Palladium	Pd	46	106·4	Strontium	Sr	38	87·6
Phosphorus	P	15	31·0	Sulphur	S	16	32·1
Platinum	Pt	78	195·1	Tantalum	Ta	73	180·9
Plutonium	Pu	94	[242]	Technetium	Tc	43	[99]
Polonium	Po	84	[210]	Tellurium	Te	52	127·6
Potassium	K	19	39·1	Terbium	Tb	65	158·9
Praseodymium	Pr	59	140·9	Thallium	Tl	81	204·4
Promethium	Pm	61	[147]	Thorium	Th	90	[232]
Protactinium	Pa	91	[231]	Thulium	Tm	69	168·9
Radium	Ra	88	[226]	Tin	Sn	50	118·7
Radon	Rn	86	[222]	Titanium	Ti	22	47·9
Rhenium	Re	75	186·2	Tungsten	W	74	183·9
Rhodium	Rh	45	102·9	Uranium	U	92	[238]
Rubidium	Rb	37	85·5	Vanadium	V	23	50·9
Ruthenium	Ru	44	101·1	Xenon	Xe	54	131·3
Samarium	Sm	62	150·4	Ytterbium	Yb	70	173·0
Scandium	Sc	21	45·0	Yttrium	Y	39	88·9
Selenium	Se	34	79·0	Zinc	Zn	30	65·4
Silicon	Si	14	28·1	Zirconium	Zr	40	91·2

The atomic weights [in brackets] of the radio-active elements are those of the most stable isotopes of the elements concerned. Actinium, polonium, protactinium, radium, radon, thorium and uranium occur in nature, but all other radio-active elements have so far only been obtained artificially.

Chemical Formulae

Acetaldehyde; CH_3CHO
Acetic acid: CH_3COOH
Acetone: CH_3COCH_{33}
Acetylene: C_2H_2
Alcohol (Ethyl): CH_3CH_2OH
Aluminium chloride: $AlCl_3$
Aluminium hydroxide: $Al(OH)_3$
Aluminium oxide: Al_2O_3
Aluminium sulphate: $Al_2(SO_4)_3$
Ammonia: NH_3
Ammonium carbonate: $(NH_4)_2CO_3$
Ammonium chloride: NH_4Cl
Ammonium nitrate: NH_4NO_3
Ammonium sulphate: $(NH_4)_2SO_4$
Amyl acetate: $CH_3COOC_5H_{11}$
Aniline: $C_6H_5NH_2$
Barium chloride: $BaCl_2$
Barium hydroxide: $Ba(OH)_2$
Barium sulphate: $BaSO_4$

Benzaldehyde: C_6H_5CHO
Benzene: C_6H_6
Borax: $Na_2B_4O_7$
Boric acid: H_3BO_3
Bromoform: $CHBr_3$
Calcium bromide: $CaBr_2$
Calcium carbide: CaC_2
Calcium carbonate: $CaCO_3$
Calcium chloride: $CaCl_2$
Calcium hydroxide: $Ca(OH)_2$
Calcium oxide: CaO
Calcium sulphate: $CaSO_4$
Calcium sulphide: CaS
Carbon dioxide: CO_2
Carbon monoxide: CO
Carbon tetrachloride: CCl_4
Chloroform: $CHCl_3$
Chrome alum: $K_2SO_4.Cr_2(SO_4)_3.24H_2O$
Chromium oxide: Cr_2O_3
Copper nitrate: $Cu(NO_3)_2$
Copper oxide (Cupric): CuO
Copper oxide (Cuprous): Cu_2O
Copper sulphate: $CuSO_4$
Copper sulphide: CuS
Dextrose: $C_6H_{12}O_6$
Ether (Ethyl): $(C_2H_5)_2O$
Ethyl alcohol: CH_3CH_2OH
Ethylene: C_2H_4
Ethyl chloride: C_2H_5Cl
Ferrous ammonium sulphate: $(NH_4)_2SO_4,FeSO_4,6H_2O$
Ferric chloride: $FeCl_3$
Ferric hydroxide: $Fe(OH)_3$
Ferric oxide: Fe_2O_3
Ferrous carbonate: $FeCO_3$
Ferrous oxide: FeO
Ferrous sulphate: $FeSO_4$
Formaldehyde: $HCHO$
Formic acid: $HCOOH$
Glycerin: $CH_2OH{\cdot}CHOH{\cdot}CH_2OH$
Hydrochloric acid: HCl
Hydrogen peroxide: H_2O_2
Hydrogen sulphide: H_2S
Iodoform: CHI_3
Lactose: $C_{12}H_{22}O_{11}$
Lead acetate: $(CH_3COO)_2Pb$
Lead carbonate (basic): $2PbCO_3,Pb(OH)_2$
Lead monoxide (Litharge): PbO
Lead oxide (Red lead): Pb_3O_4
Lead sulphate: $PbSO_4$
Lead sulphide: PbS
Magnesium chloride: $MgCl_2$
Magnesium hydroxide: $Mg(OH)_2$
Magnesium oxide: MgO
Magnesium peroxide: MgO_2
Magnesium phosphate: $Mg_3(PO_4)_2$
Magnesium sulphate: $MgSO_4$
Manganese dioxide: MnO_2
Mercuric oxide: HgO
Mercuric sulphate: $HgSO_4$
Mercurous sulphate: Hg_2SO_4
Methane: CH_4
Methyl alcohol: CH_3OH
Methyl chloride: CH_3Cl
Methyl iodide: CH_3I
Naphthalene: $C_{10}H_8$
Nickel oxide: NiO
Nitric acid: HNO_3
Nitric oxide: NO
Nitrobenzene: $C_6H_5NO_2$
Nitrous acid: HNO_2
Nitrous oxide: N_2O
Oxalic acid: $(COOH)_2$
Phenol: C_6H_5OH
Phenolphthalein: $C_{22}H_{14}O_4$
Phosphoric acid: H_3PO_4
Phosphorous acid: HPO_3
Potassium aluminium sulphate (alum): $K_2SO_4,Al_2(SO_4)_3,24H_2O$
Potassium bicarbonate: $KHCO_3$
Potassium bichromate: $K_2Cr_2O_7$
Potassium bromide: KBr

Potassium carbonate: K_2CO_3
Potassium chlorate: $KClO_3$
Potassium chloride: KCl
Potassium chromate: K_2CrO_4
Potassium iodide: KI
Potassium manganate: K_2MnO_4
Potassium nitrate: KNO_3
Potassium nitrite: KNO_2
Potassium permanganate: $KMnO_4$
Potassium sulphate: K_2SO_4
Potassium sulphide: K_2S
Propylene: C_3H_6
Quinol: $C_6H_4(OH)_2$
Saccharin: $C_6H_4CO{\cdot}SO_2NH$
Sodium bicarbonate: $NaHCO_3$
Sodium bromide: NaBr
Sodium carbonate: Na_2CO_3
Sodium chlorate: $NaClO_3$
Sodium chloride: NaCl
Sodium hydroxide: NaOH
Sodium nitrate: $NaNO_3$
Sodium nitrite: $NaNO_2$
Sodium phosphate: Na_2HPO_4
Sodium sulphate: Na_2SO_4
Sodium sulphite: Na_2SO_3
Sodium thiosulphate: $Na_2S_2O_3$
Sulphuric acid: H_2SO_4
Sulphurous acid: H_2SO_3
Stannic oxide: SnO_2
Strontium carbonate: $SrCO_3$
Strontium chloride. $SrCl_2$
Strontium nitrate: $Sr(NO_3)_2$
Sucrose: $C_{12}H_{22}O_{11}$
Sulphur dioxide: SO_2
Sulphur trioxide: SO_3
Water: H_2O
Zinc chloride: $ZnCl_2$
Zinc oxide: ZnO
Zinc sulphate: $ZnSO_4$

Chemical and Common Names of Familiar Substances

Accumulator acid	Moderately strong sulphuric acid (H_2SO_4) containing about 34 per cent concentrated acid and 66 per cent distilled water. The specific gravity of the solution should be about 1·25.
Alum	Potassium aluminium sulphate [$K_2SO_4,Al_2(SO_4)_3,24H_2O$].
Aqua fortis	Concentrated nitric acid (HNO_3).
Aqua regia	Mixture of concentrated nitric and hydrochloric acids in ratio of 1 part HNO_3 to 4 parts HCl.
Blue vitriol	Crystalline copper sulphate ($CuSO_4,5H_2O$).
Boracic acid	Boric acid (H_3BO_3).
Borax	Sodium pyroborate ($Na_2B_4O_7$).
Bromide	Potassium bromide (KBr).
Carbolic acid	Phenol (C_6H_5OH).
Carbonic acid gas	Carbon dioxide (CO_2)
Caustic soda	Sodium hydroxide (NaOH).
Chalk	Calcium carbonate ($CaCO_3$).
Common salt	Sodium chloride (NaCl).
Epsom salt	Crystalline magnesium sulphate ($MgSO_4,7H_2O$).

Firedamp	Methane (CH_4).
Glauber's salt	Crystalline sodium sulphate ($Na_2SO_4,10H_2O$).
Green vitriol	Crystalline ferrous sulphate ($FeSO_4,7H_2O$).
Hypo	Sodium thiosulphate ($Na_2S_2O_3$).
Lime	Calcium oxide (CaO).
Magnesia	Magnesium oxide (MgO).
Muriate of potash	Potassium chloride (KCl).
Natural gas	Mixture of inflammable gases which issues from holes in the Earth's crust in certain localities. Methane (CH_4) is usually the main constituent.
Nitre	Potassium nitrate (KNO_3).
Oil of vitriol	Concentrated sulphuric acid (H_2SO_4).
Plaster of Paris	Form of calcium sulphate having the formula $CaSO_4,\frac{1}{2}H_2O$.
Quicklime	Calcium oxide (CaO).
Potash	Potassium carbonate (K_2CO_3).
Red lead	Red lead oxide (Pb_3O_4).
Sal ammoniac	Ammonium chloride (NH_4Cl).
Saltpetre	Potassium nitrate (KNO_3).
Sal volatile	Ammonium carbonate [$(NH_4)_2\,CO_3$].
Salts of lemon	Potassium hydrogen oxalate [$KH_3(OOC)_4,2H_2O$].
Slaked lime	Calcium hydroxide [$Ca(OH)_2$].
Spirits of salt	Solution of hydrochloric acid (HCl).
Vinegar	Solution of acetic acid (CH_3COOH).
Washing soda	Crystalline sodium carbonate ($Na_2CO_3,10H_2O$).

Plane and Solid Figures (Figs 2 and 3)

Triangle: Any plane figure enclosed by three straight lines. (A)
Right-angled triangle: A triangle containing one right angle. (B)
Isosceles triangle: A triangle having two sides of equal length. (C)
Equilateral triangle: A triangle having all three sides of equal length. (D)
The area of a triangle is half of the length of its base multiplied by its perpendicular height ($\frac{1}{2}\,b \times h$). (A)

Quadrilateral: Any plane figure enclosed by four straight lines. (E)
Trapezium: A quadrilateral having one pair of sides parallel. (F)
Parallelogram: A quadrilateral having both pairs of opposite sides parallel. (G)
Rhombus: A quadrilateral having all sides equal in length. (H)
Square: A quadrilateral having all sides equal in length and all angles equal (*i.e.* all right angles). (I)

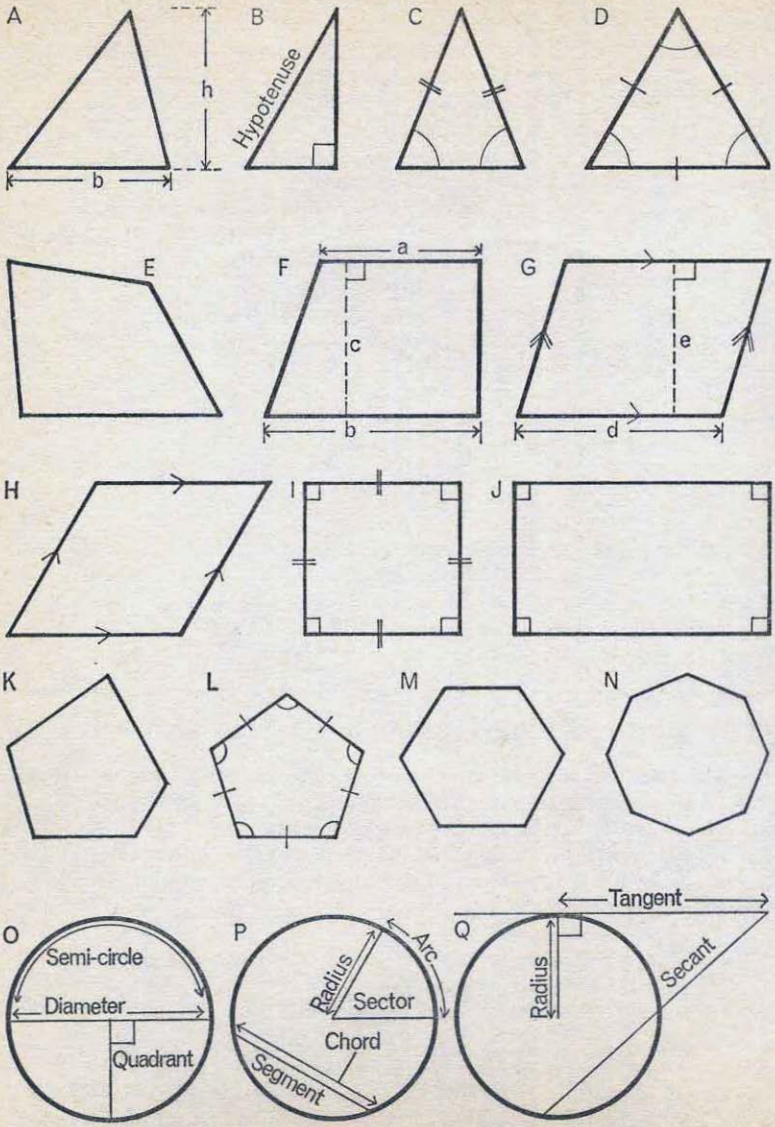


Fig. 2. Plain figures

Rectangle: A quadrilateral with all angles equal (*i.e.* all right angles). (J)

The area of a trapezium is half the sum of the lengths of its parallel sides multiplied by the perpendicular distance between them [$\frac{1}{2}(a + b) \times c$]. (F)

The area of a parallelogram is length of one side multiplied by the perpendicular distance to the opposite side ($d \times e$). (G)

Pentagon: Any plane figure enclosed by five straight lines. (K)
Regular pentagon: A pentagon having all sides equal in length and all angles equal. (L)
Hexagon: Any plane figure enclosed by six straight lines. (M)
Octagon: Any plane figure enclosed by eight straight lines. (N)
Polygon: A plane figure enclosed by any number of straight lines, especially a figure having more than four sides.

The Circle

Arc: Any part of the circumference of a circle. (P)
Chord: A straight line joining two points on the circumference. (P)
Circle: A plane figure enclosed by a line (the circumference) which is, at all points, the same distance from the centre.
Diameter: A chord passing through the centre of a circle. It is twice as long as the radius. (O)
Quadrant: A quarter of a circle: an area enclosed by two radii at *right angles*, and an arc. (O)
Radius: A straight line from the centre to the circumference. (P)
Secant: A straight line from a point outside the circle which *cuts* the circle. (Q)
Sector: An area enclosed by an arc and two radii. (P)
Semi-circle: Half a circle: an area enclosed by an arc and a diameter. (O)
Segment: An area cut off by a chord. (P)
Tangent: A straight line which *touches* a circle. It is at right angles to the radius at the point of contact. (Q)

The circumference of a circle is its diameter multiplied by π. (πd, or $2\pi r$.)

The area of a circle is its radius squared multiplied by π. (πr^2.)

Prism: A solid figure whose side faces are parallelograms and whose two end faces are identical, equal polygons which are in planes parallel to one another. Fig. 3 (B)

The term prism is often used to describe the simplest form – the *triangular prism* – whose end faces are triangles. Fig. 3 (A)

The *cube* is a particular type of prism – one having square end faces and square side faces. Fig. 3 (C)

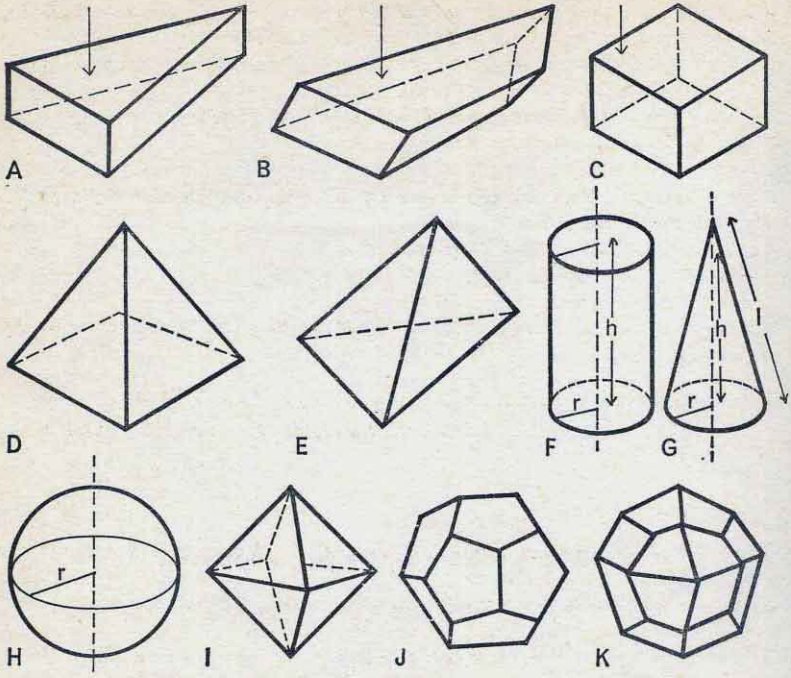


Fig. 3. Solid figures

Pyramid: A solid figure having for one of its faces (the *base*) a polygon, the remaining faces being triangles which rise to a common vertex. (D)

The great Egyptian pyramids were built on square bases, while the simplest form with a triangular base – also called a *tetrahedron* – is now finding favour as a convenient shape for cardboard milk containers. (E)

The volume of a pyramid is one-third of its base area multiplied by its perpendicular height.

Cone: A solid figure produced by rotating a line about an axis with which the line is not parallel. A cone is a pyramid on a circular base. (G)

Area of the curved surface of a cone is half the circumference of its base (πr) multiplied by its slant height (l). (πrl.)

Volume of a cone is one-third of its base area ($\frac{1}{3}\pi r^2$) multiplied by its perpendicular height (h). ($\frac{1}{3}\pi r^2 h$.)

Cylinder: A solid figure produced by rotating a line about a parallel axis. A cylinder is a prism having circular end faces. (F)

Area of the curved surface of a cylinder is circumference of its base ($2\pi r$) multiplied by its height (h). ($2\pi rh$.)

Volume of a cylinder is its base area (πr^2) multiplied by its height (h). ($\pi r^2 h$.)

Sphere: A solid figure produced by rotating a semi-circle about a diameter as axis. (H)

Area of the surface of a sphere is $4\pi r^2$.

Volume of a sphere is $\frac{4}{3}\pi r^3$.

Octahedron: A solid figure having eight faces, particularly one having eight triangular faces. (I)

Dodecahedron: A solid figure with twelve faces; the faces may be equal pentagons in a *regular dodecahedron*, or rhombs in a *rhombic dodecahedron.* (J & K)

Functions of π

$\pi = 3{\cdot}14159$ (*or* $3{\cdot}142$ *or very approximately* $\frac{22}{7}$)

$2\pi = 6{\cdot}2832$	$3\pi = 9{\cdot}4248$	$\frac{\pi}{2} = 1{\cdot}5708$
$\frac{\pi}{3} = 1{\cdot}0472$	$\frac{\pi}{4} = 0{\cdot}7854$	$\frac{4}{3}\pi = 4{\cdot}1888$
$\frac{1}{\pi} = 0{\cdot}3183$	$\frac{1}{2\pi} = 0{\cdot}1592$	$\log \pi = 0{\cdot}4971$

Mathematical Signs

$=$	Is equal to	Σ	The sum of
$\neq$	Is not equal to	δ	A small difference
$\fallingdotseq$	Is approx. equal to	$\angle$	Angle
$\equiv$	Is identical to	∞	Infinity
$\sim$	The difference between		
$\propto$	Varies as		
$>$	Greater than	60 seconds ($''$) = 1 minute ($'$)	
$\ngtr$	Not greater than	60 minutes = 1 degree ($^\circ$)	
$<$	Less than	90 degrees = 1 right angle	
$\nless$	Not less than	4 right angles = 1 circle (360°)	

Trigonometrical Ratios

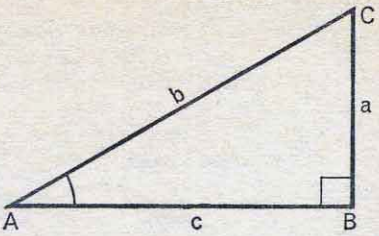
In a right-angled triangle

$$\sin A = \frac{\text{opposite}}{\text{hypoteneuse}} = \frac{a}{b}$$

$$\cos A = \frac{\text{adjacent}}{\text{hypoteneuse}} = \frac{c}{b}$$

$$\sec A = \frac{\text{hypoteneuse}}{\text{adjacent}} = \frac{b}{c}$$

$$\text{cosec } A = \frac{\text{hypoteneuse}}{\text{opposite}} = \frac{b}{a}$$



$$\tan A = \frac{\text{opposite}}{\text{adjacent}} = \frac{a}{c} \qquad \text{cotan } A = \frac{\text{adjacent}}{\text{opposite}} = \frac{c}{a}$$

Imperial Weights and Measures

Length

12 inches = 1 foot
3 feet = 1 yard
$5\frac{1}{2}$ yards = 1 pole
22 yards (= 4 poles) = 1 chain
220 yards (= 10 chains) = 1 furlong
8 furlongs (= 1,760 yards) = 1 mile

Area

144 sq. inches = 1 sq. foot
9 sq. feet = 1 sq. yard
$30\frac{1}{4}$ sq. yards = 1 sq. rod, pole or perch
40 sq. perches (= 1,210 sq. yards) = 1 rood
4 roods (= 4,840 sq. yards) = 1 acre
640 acres = 1 sq. mile

Volume

1,728 cubic inches = 1 cubic foot
27 cubic feet = 1 cubic yard

Length at Sea

6 feet = 1 fathom
6,080 feet = 1 nautical mile
(1 knot is a speed of 1 nautical mile/hour.)

Avoirdupois Weight

16 drams (*dr.*) = 1 ounce (*oz.*)
16 ounces = 1 pound (*lb.*)
7,000 grains = 1 pound
14 pounds = 1 stone
28 pounds = 1 quarter (*qr.*)
4 quarters (= 112 *lb.*) = 1 hundredweight (*cwt.*)
20 cwt (= 2,240 *lb.*) = 1 ton

Apothecaries' Weight (*Used for drugs*)

20 grains = 1 scruple (℈)
3 scruples = 1 drachm (ʒ)
8 drachms = 1 ounce (℥)

Apothecaries' Liquid Measure (*Used for drugs*)

60 minims (m) or drops = 1 fluid drachm (*f*ʒ)
8 fluid drachms = 1 fluid ounce (*f*℥)
20 fluid ounces = 1 pint
(The Apothecaries' grain is the same as the Avoirdupois grain, but the Apothecaries' oz. is the Troy oz.)

Troy Weight (*Used for precious metals*)

3·1683 grains (*gr.*) = 1 carat
24 grains = 1 pennyweight (*dwt.*)
20 pennyweights = 1 ounce
12 ounces = 1 pound (*lb.*)

Capacity

For Liquids and Solids
4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 (Imperial) gallon

For Solids only
2 gallons = 1 peck
4 pecks (= 8 gallons) = 1 bushel
8 bushels = 1 quarter

Metric Weights and Measures

(Only those metric units which are in regular use have been included in the following list. However, all the prefixes (e.g. milli-, kilo-) used in forming metric units are listed under 'Multiples and Sub-Multiples of Numbers', see page 73.)

Length

1,000 microns (μ) = 1 millimetre (*mm.*)
10 millimetres = 1 centimetre (*cm.*)
100 centimetres = 1 metre (*m.*)
1,000 metres = 1 kilometre (*km.*)

Area

100 sq. metres = 1 are
100 ares = 1 hectare
100 hectares = 1 sq. kilometre

Weight

1,000 milligrammes (*mg.*) = 1 gramme (*g.*)
1,000 grammes = 1 kilogramme (*kg.*)
1,000 kilogrammes = 1 tonne*

* Known as the *metric* ton (= 2,204 lb.) to avoid confusion with the *long* or *English* ton (= 2,240 lb.) and the *short* or *US* ton (= 2,000 lb).

Capacity

1,000 millilitres (*ml.*) = 1 litre (*l.*)
1,000 litres = 1 kilolitre
1 kilolitre = 1 cubic metre

In May 1965 the President of the Board of Trade announced the intention of the UK to switch over to the metric system 'within ten years'. Many changes are likely in the period immediately following the introduction of decimal currency in February 1971. During the period of the changeover we shall have to use English and metric units side by side. Some products, notably pharmaceutical and toilet preparations ranging from ointments to hair cream, are already supplied in containers showing weight or capacity in metric units.

Conversion Tables – Imperial

Length

1 inch	=	25·4 millimetres
1 foot	=	0·3048 metre
1 yard	=	0·9144 metre
1 fathom	=	1·8288 metres
1 pole	=	5·0292 metres
1 chain	=	20·117 metres
1 furlong	=	201·17 metres
1 mile	=	1·6093 kilometres

Area

1 sq. inch	=	6·4516 sq. centimetres
1 sq. foot	=	929·03 sq. centimetres
1 sq. yard	=	0·8361 sq. metre
1 sq. perch	=	25.293 sq. metres
1 rood	=	10·117 ares
1 acre	=	0·40469 hectare
1 sq. mile	=	259·00 hectares

Volume

1 cub. inch	=	16·387 cub. centimetres
1 cub. foot	=	0·028317 cub. metre
1 cub. yard	=	0·76455 cub. metre

Capacity

1 gill	=	142 millilitres
1 pint	=	568 millilitres
1 quart	=	1·136 litres
1 gallon	=	4·54596 litres
1 peck	=	9·092 litres
1 bushel	=	36·37 litres
1 quarter	=	0·29096 kilolitres

Avoirdupois

1 grain	=	0·0648 gram
1 dram	=	1·772 grams
1 ounce	=	28·350 grams
1 pound	=	0·45359 kilograms
1 stone	=	6·350 kilograms
1 quarter	=	12·70 kilograms
1 hundredweight	=	50·80 kilograms
1 (long) ton	=	1·016 metric tons

Apothecaries'

1 minim	=	0·059 millilitre
1 fluid scruple	=	1·184 millilitres
1 fluid drachm	=	3·552 millilitres
1 fluid ounce	=	28·4123 millilitres
1 pint	=	568 millilitres
1 grain	=	0·0648 gram
1 scruple (20 grains)	=	1·296 grams
1 drachm (3 scruples)	=	3·888 grams
1 oz. (8 drachms)	=	31·1035 grams

Troy

1 grain	=	0·0648 gram
1 pennyweight	=	1·5552 grams
1 troy ounce	=	31·1035 grams

Conversion Tables – Metric

Length

1 millimetre	=	0·03937 inch
1 centimetre	=	0·3937 inch
1 metre	=	3·28084 feet 1·0936 yards
1 kilometre	=	0·62137 mile

Area

1 square centimetre	=	0·15500 sq. inch
1 square metre	=	10·7639 sq. feet 1·1960 sq. yards
1 are	=	119·60 sq. yards
1 hectare	=	2·471 acres

Volume

1 cubic centimetre	=	0·061 cubic inch
1 cubic metre (1,000 cubic decimetres)	=	35·315 cubic feet 1·30795 cubic yards

Capacity

1 litre	=	1·7598 pints 0·220 gallons
1 kilolitre	=	27·5 bushels

Weight

		Avoirdupois
1 milligram	=	0·15 grain
1 gram	=	15·432 grains 0·03527 oz.
1 kilogram	=	2·2046 lb.
1 tonne	=	0·984 (long) ton

		Troy
1 gram	=	0·03215 oz. troy 15·432 grains

		Apothecaries'
1 gram	=	0·2572 drachm 0·7716 scruple 15·432 grains

Multiples and Sub-multiples of Numbers

Metric System

The following is the full range (in ascending order of size) of prefixes used in forming metric units:

Prefix	*Abbreviation*	*Multiplying factor*
atto	a	0·000 000 000 000 000 001
femto	f	0·000 000 000 000 001
pico	p	0·000 000 000 001
nano	n	0·000 000 001
micro	μ	0·000 0001
milli	m	0·001
centi	c	0·01
deci	d	0·1
deca	da	10
hecto	h	100
kilo	k	1,000
mega	M	1,000,000
giga	G	1,000,000,000
terra	T	1,000,000,000,000

English System

dozen	12
score	20
hundred	5 score
great hundred	6 score (120)
gross	12 dozen (144)
great gross	12 gross (1728)

Miscellaneous

lakh (India)	= 100,000
crore (India)	= 100 lakh
	= 10,000,000
milliard	= 1,000,000,000
billion (USA and France)	= 1,000,000,000

billion (UK)	= 1,000,000,000,000
trillion (USA)	= 1,000,000,000,000

In view of the confusion over the value of a *billion* it is safer to talk of a *thousand million* or a *million million* (as the case may be) when it is not convenient to express the quantity in figures.

Rough Conversions

(Very approximate: intended for rough calculations only)

1 inch	=	2½ centimetres
1 foot	=	30 centimetres
1 acre	=	0·4 hectares
1 grain	=	65 milligrams
1 lb.	=	0·45 kilogram
7 quarts	=	8 litres
1 metre	=	39½ inches
1 kilometre	=	⅝ mile
1 kilogram	=	2·2 lb.
1 litre	=	1¾ pints

Miscellaneous Measures

1 *gallon* of pure water weighs 10 lb.
A hand (when measuring a horse) is 4 inches.
A reputed quart (as in a bottle of wine, or spirit) is one-sixth of a gallon.
The gram (metric) is the weight of 1 cubic centimetre of pure water.
The litre (metric) is 1,000 cubic centimetres of pure water, and weighs 1 kilogram.
The British Thermal Unit (Btu) is the amount of heat required to raise 1 lb. of water by 1° F.
The Therm = 100,000 Btu.
The horsepower (H.P.) is the power needed to raise 550 lb. one foot in one second (or 33,000 lb. one foot in one minute).
The kilowatt (1,000 watts) is the power needed to raise 737·6 lb. one foot in one second (746 watts = 1 H.P.).
The Unit (Board of Trade unit, or B.o.T.U.) is consumption of electricity equal to 1,000 watts for one hour.

Temperature Scales

The Centigrade (or Celsius) temperature scale is used almost universally

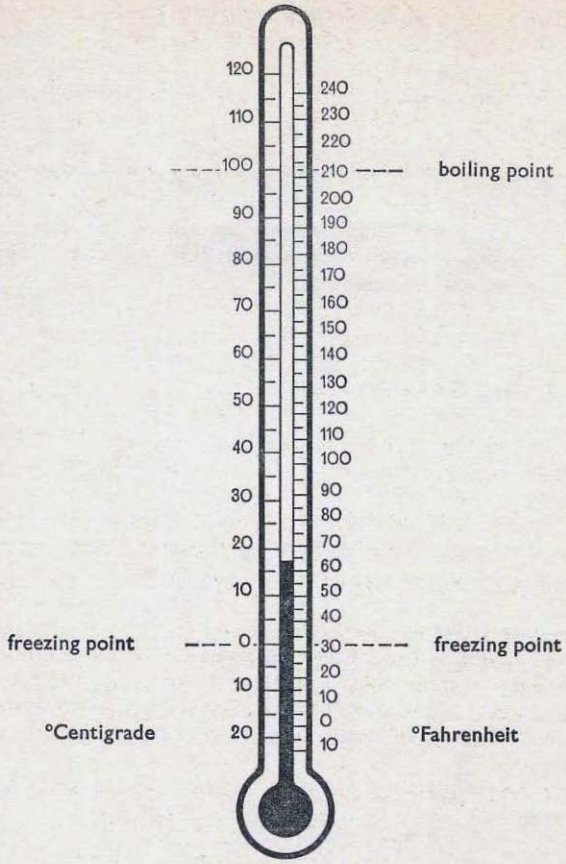


Fig. 4. Fahrenheit and Celsius scales shown on the same thermometer

in scientific laboratories, while the other common scale – the Fahrenheit scale – is still used extensively in engineering both in the UK and USA. For many years weather reports in the UK gave temperatures in degrees Fahrenheit but in 1962 the Meteorological Office made the first step towards abandoning the Fahrenheit scale by giving the values of temperatures on both scales.

Until the Celsius scale is accepted universally, it will be necessary from time to time to convert temperatures from one scale to another. This is easily done by using simple arithmetic but various handy charts or tables can be used if great accuracy is not required and there are many temperatures to convert.

Temperature scales provide a means of comparing a particular temperature with certain reference points, the two most important being the temperature at which pure ice melts (often called the *lower fixed point*) and the temperature at which pure water boils under a pressure of one standard atmosphere (the *upper fixed point*).

On the Celsius scale the lower fixed point is designated 0° C., while the upper fixed point is 100° C. In contrast, the Fahrenheit scale ranges from 32° F. at the lower fixed point to 212° F. at the upper.

Thus 100 divisions or degrees between the two fixed points on the Celsius scale are equivalent to 180 divisions or degrees on the Fahrenheit scale. This reduces to the simpler ratio, 5 Celsius divisions are equivalent to 9 of the smaller Fahrenheit divisions. However, conversion between the two scales is complicated slightly because the two scales have different zeros.

To convert a Fahrenheit temperature to Celsius first subtract 32, then multiply by 5 and divide by 9. Thus to convert 98·4° F. (normal blood temperature).

$$98{\cdot}4\ \text{F°.} \equiv (98{\cdot}4 - 32)\ \text{Fahrenheit degrees above ice point}$$
$$\equiv 66{\cdot}4\ \text{F°. above ice point.}$$
$$180\ \text{F°.} \equiv 100\ \text{C°.}$$
$$1\ \text{F°.} \equiv \frac{100\text{C}}{180}\ \text{°.} = \frac{5\text{C}}{9}\ \text{°.}$$

$$66{\cdot}4\ \text{F°. above ice point} \equiv \frac{5}{9} \times 66{\cdot}4 = 36{\cdot}9\ \text{C°. above ice point}$$
$$= 36{\cdot}9\ \text{C°.}$$

Thus normal blood temperature is 36·9° C.

Conversely, to convert a Celsius temperature to Fahrenheit, first multiply by 9 and divide by 5, then finally add 32.

Every substance – even ice – contains a certain amount of heat. This is another way of saying that the molecules of any substance (the smallest

possible part of the substance which can lead a separate existence) are constantly in motion: heating the substance gives the molecules more energy to move faster. The hotter the substance becomes the faster its molecules move. Conversely, cooling the substance slows down the molecules.

If we continue cooling the substance, the motion of the molecules eventually slows down so much that they stop moving all together. The temperature at which this occurs (although no one has yet actually reached it) is the lowest that can be attained and is known as the *absolute zero*. On the Celsius scale absolute zero is — 273·16° C., while on the Fahrenheit scale it is — 459·69° F.

The Greek Alphabet

This alphabet is important because its letters are used so often in mathematical and scientific formulae and equations and to represent well-known constants such as the ratio of the circumference of a circle to its diameter (π). The word 'alphabet' itself is derived from the first two Greek letters.

Letter		*Name*	*English Equivalent*
A	α	Alpha	a
B	β	Beta	b
Γ	γ	Gamma	g (*hard*)
Δ	δ	Delta	d
E	ϵ	Epsilon	e (*short*)
Z	ζ	Zeta	z, dz
H	η	Eta	e (*long*)
Θ	θ	Theta	th
I	ι	Iota	i
K	κ	Kappa	k, *or hard* c
Λ	λ	Lambda	l
M	μ	Mu	m
N	ν	Nu	n
Ξ	ξ	Xi	x
O	o	Omicron	o (*short*)
Π	π	Pi	p
P	ρ	Rho	r
Σ	σ,s	Sigma	s
T	τ	Tau	t
Y	υ	Upsilon	u *or* y
Φ	ϕ	Phi	ph, f

Letter		*Name*	*English Equivalent*
X	χ	Chi	kh *or hard* ch
Ψ	ψ	Psi	ps
Ω	ω	Omega	o (*long*)

Further Reading

Men Who Changed the World; stories of invention and discovery, Egon Larsen (Phoenix).
Collins Children's Encyclopedia of Knowledge, Book of Science (Collins).
The Boys' Book of Modern Scientific Wonders, Leonard Bertin (Burke).
Understanding Science: a 12-volume encyclopedia originally published (1962–5) in 144 weekly parts (Sampson Low).
Science, Ed. by J. Bronowski (Macdonald).
Magnets, Bulbs and Batteries; *Light, Mirrors and Lenses*; *Air, Wind and Flight*; and *Levers, Pulleys and Engines*, F. E. Newing and Richard Bowood (Wills & Hepworth).
The Young Scientist's Approach to Light, T. H. Whitney (Warne).
The Young Scientist's Approach to Magnetism, T. H. Whitney (Warne).
The Magic of Electricity, Sam Rosenfeld (Faber).
How Much and How Many; the story of weights and measures, Jeanne Bendick (Brockhampton).
Marvels of Modern Science, Ed. L. J. Carter (Evans).

Exploring and Camping

It is always enjoyable to hike through familiar countryside or to go exploring in new surroundings, but it can be far more exciting to have a definite objective on such expeditions. In fact to pursue a number of hobbies to the full, it is essential to go out into the countryside to gather information or collect specimens. You may already have such a hobby, but if you are looking for a new excuse to go exploring, why not try one of the following:

follow the course of a small river or stream to its source, starting each time from where you left off on the last hike;

make rubbings of the bark of various trees, or prints of their leaves and identify them;

visit a bird sanctuary, heronry or pond and count the number of birds seen;

see how many different types of styles you can log and notice how many are made from materials that are available locally;

compare the way churches, and for that matter farm cottages, of different ages have been built;

find out about the history of villages by visiting their churches and other old buildings.

go to the highest point in the neighbourhood with a map and compass to locate distant places and return on a finer (clearer) day to locate places even farther away.

Planning the Route

Before setting out on an expedition – whether it is just for the afternoon or will occupy a whole week's holiday – it is well worth spending some time planning a route. In having a definite route – chosen to take in places where you are likely to see the things you are looking for – you will be able to make the best use of your time. This will also help you to get home at the time you were expected.

It is far better not to try to go too far at first – if you have time to spare you can always spend longer looking around an interesting village, or farm or searching in the woods for uncommon trees, or plants or for a badger's set.

A good map – 1 in. Ordnance Survey or $\frac{1}{2}$ in. Bartholomew's – is essential both when planning the expedition and when you are out in the countryside. Other items which will come in useful include local guide books and bus and train time tables. Remember that some rural bus services are very infrequent and that some villages may only be served on the local market day.

It may be tempting, particularly if you do not have much pocket-money to pay fares and yet want to explore a distant area, to reach your

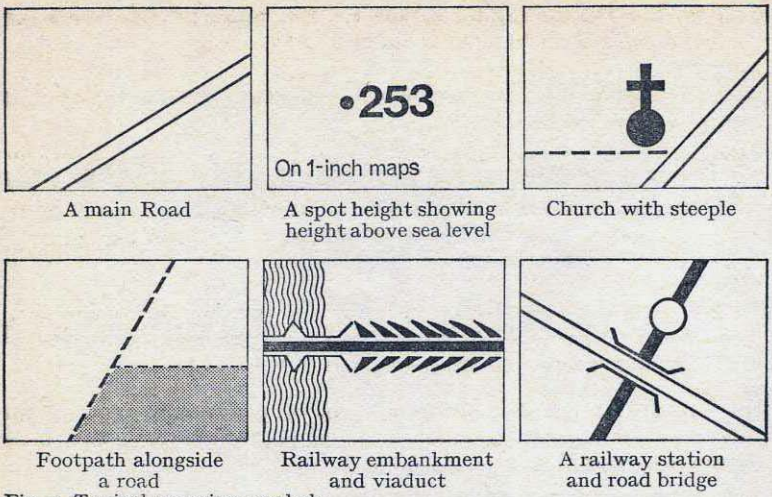


Fig. 5. Typical mapping symbols

objective by hitch-hiking. Not only is hitch-hiking little different from begging, it can also be dangerous. Do not try it. You may get picked up by an undesirable person. If you want to go a long way, earn the money for your fare first, or alternatively look at the map again to find a place of interest to visit which is nearer home.

At first glance, a small-scale map of the type most useful for hiking appears very confusing since many objects of interest are identified only by symbols, but with a little practice one becomes familiar with maps and from then on they are constant and trusty companions on each and every expedition.

If maps are a mystery to you the first step in mastering their secrets is to learn the symbols used on them. A number of the more common ones are shown in Figure 5 but as different series of maps (and indeed different editions of the same series) sometimes use slightly different symbols, it is as well to study the key which is usually given at the foot of each sheet.

When you think you can recognize most of the symbols trace the route of a favourite walk on the map. All the time think of places which you pass and objects which you can see in the distance and compare these with what you can see on the map. When you have done this several times you can start to visualize from the map what you will find in reality.

Once you have become proficient you will find maps invaluable both out in the field and in planning your routes in advance.

Finding the Way

In finding one's way through the countryside, it is not enough to be able to read a map, valuable though this skill is. A map only shows places in relation to one another. To be able to find your way you must know where you are on the map and by referring to the map and to your surroundings in which direction you must travel.

To do this in the wilder parts of the country, such as the Derbyshire Peak District, Snowdonia in North Wales or the Cairngorms in Scotland it is vital to have a compass or other means of finding North.

The magnetic compass, which is also used by navigators of ships and aircraft in plotting their courses, can be marked in several ways two of which are shown in Figure 6 overleaf.

In the *Circular System* all bearings are measured clockwise from North, the circle being divided into 360°. In the *Point System* the compass circle is first divided into four quadrants – between North and East; East and South; South and West; and West and North – as shown in the diagram. Each of these quadrants is subdivided into eight, giving a total of 32 points. The following table gives the bearing on the circular system equivalent to each of the 32 points of the compass.

Points of the Compass	*Circular*	*Points of the Compass*	*Circular*
N.	0	S.S.E.	157½
N. by E.	11¼	S. by E.	168¾
N.N.E.	22½	S.	180
N.E. by N.	33¾	S. by W.	191¼
N.E.	45	S.S.W.	202½
N.E. by E.	56¼	S.W. by S.	213¾
E.N.E.	67½	S.W.	225
E. by N.	78¾	S.W. by W.	236¼
E.	90	W.S.W.	247½
E. by S.	101¼	W. by S.	258¾
E.S.E.	112½	W.	270
S.E. by E.	123¾	W. by N.	281¼
S.E.	135	W.N.W.	292½
S.E. by S.	146¼	N.W. by W.	303¾

Points of the Compass	*Circular*	*Points of the Compass*	*Circular*
N.W.	315	N.N.W.	337½
N.W. by N.	326¼	N. by W.	348¾

But you can find North (or South) without a compass – provided that the sky is clear. In daytime you can use the Sun and a watch, and at night the stars. In the watch method you simply point the hour hand of the watch towards the Sun (after deducting one hour from 'Summer

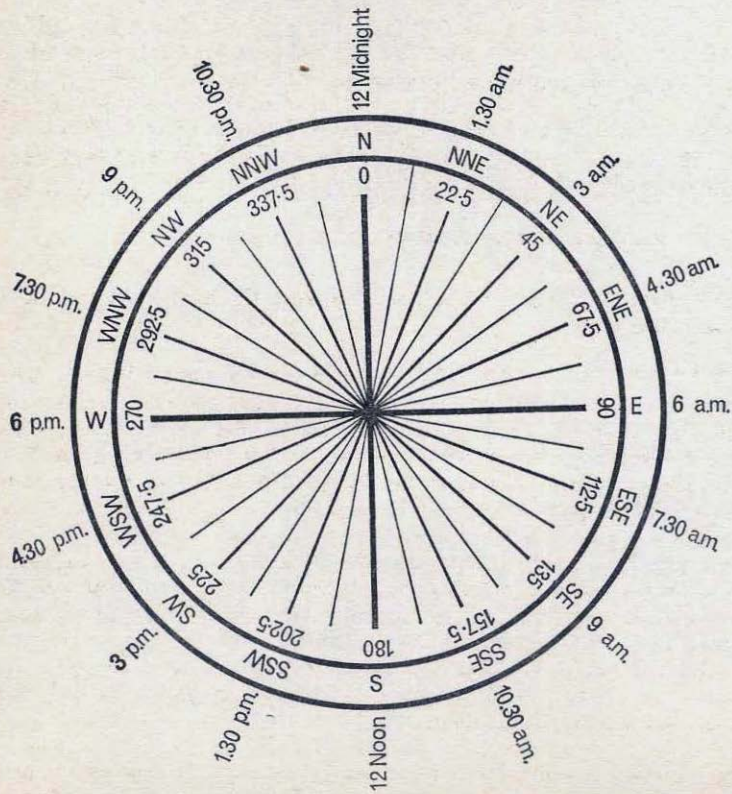


Fig. 6. A compass card marked in points and circular rotation

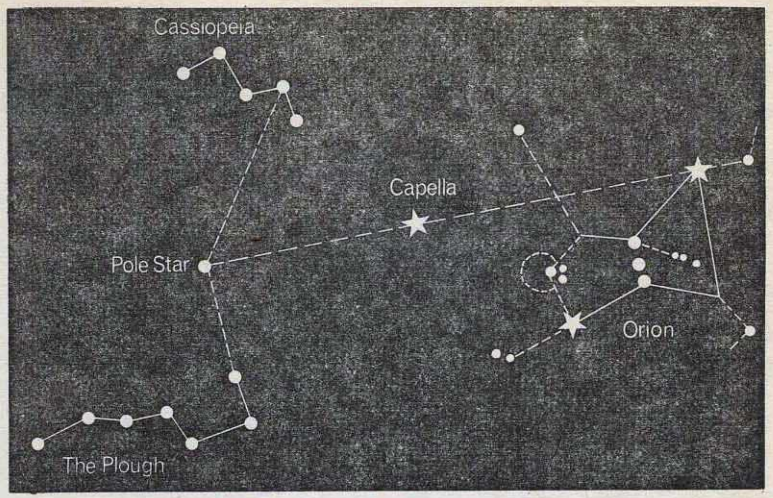


Fig. 7. Finding the north by the stars

Time' to get Sun time) and half-way between the hour hand and 12 on the dial is due South.

At night you can find North by locating the Pole Star (*Polaris*). This star is not very bright, but three constellations in the northern sky will lead you to it. Figure 7, which only shows the bright stars in the area concerned, indicates how you can find the position of the Pole Star once you have identified the Plough (*Ursa Major*), *Cassiopeia* or *Orion*.

Once you have found North you should turn your map around until the North pointer on the map points North, this is called *setting the map*. You will find on the map either two or three different North pointers – True or Geographic North (which is the North you find from the Sun or the North Star); Magnetic North (which is the direction shown by your compass, and which incidentally moves in the course of time) and possibly Grid North.

If you are quite certain where you are it is also possible to set the map by turning it until the position of landmarks shown on the map corresponds with the position of those objects in reality.

Being Prepared

When the weather is fine, it is very pleasant to walk in mountainous or other exposed country, but it can be extremely dangerous to venture out when visibility is poor, when the conditions underfoot are dangerous after heavy falls of rain, or the ground is frozen or covered with snow.

Unfortunately weather conditions in such areas are liable to change very rapidly and although the day may start off fine, it is by no means certain that the weather will continue that way all day. Thick mist comes down very quickly on the mountains.

Although this can be a frightening experience the first time one gets caught, there is no need whatsoever to panic. This is by far the worst thing to do. Unless you are on a very well-defined path which you are absolutely certain you can follow to safety, you should remain where you are. Trying to find your way off a mountain along ill-defined paths is very dangerous in mist or in a blizzard. You are liable to get hopelessly lost or even worse fall and hurt yourself.

One of the most important requirements for walking in the mountains is to have with you suitable equipment to deal with such emergencies. As well as your map and compass you should always carry a wind- and water-proof anorak, spare warm clothing and emergency rations just in case you have to spend the night on the mountains. You also need a whistle, torch and small first aid kit in case of accidents.

Always leave behind you details of your route and *keep to it*, so that if you should not return at a reasonable hour search parties will know where to look for you.

Finally, on no account venture into the mountains alone – the safest number is four or more, so that in the event of an accident or other emergency two members of the party can go off together to raise the alarm while the others look after the casualty.

Equipment for Hiking and Camping

The following lists will remind you of the items of equipment you will need to take with you on a hiking/camping expedition. If you are going to stay overnight in hostels and eat in cafés, you will only need the

personal items. In each list items have been grouped together as an aid to gathering them before packing.

Personal equipment (for all overnight expeditions)
Strong boots or shoes; plimsoles; anorak or other wind- and water-proof coat; thick sweater; spare clothing, including several pairs of thick socks; pyjamas or other change for the night.

Soap and towel; toothbrush and paste; brush and comb; metal mirror.

Map and compass; first aid kit; whistle; emergency rations; pocket knife; plastic water bottle; money; post office savings book; rucksack.

Cooking equipment
Cooking stove and fuel; matches; canteen or billycans.

Plastic bags and plastic containers (for keeping food in); tin and bottle opener; plate and mug; knife, fork and spoon.

Camping equipment
Tent with pegs and pole in valise; spare pegs; groundsheet; sleeping bag or blankets; canvas bucket; electric torch.

Packing a rucksack is an art which can only be learned by experience. However, there are four rules which should be followed always. Pack items which you are going to need first at the top or in the side pockets, but keep the heaviest ones near the top as the rucksack is easier to carry that way. Also avoid putting hard pointed objects so that they dig into your back. At all costs avoid having anything hanging outside the rucksack.

An expedition can very easily be spoiled by having an overfull, heavy rucksack, so take care in selecting what you pack. You should aim to keep the weight of the rucksack and its contents below 30 lb. This can be achieved without much difficulty as many lightweight items are now available at reasonable cost. You should have no difficulty in keeping weight down if you are going with several companions with whom you can share such items as the tent and cooking equipment.

Take particular care in selecting the foodstuffs which you carry with you. Avoid taking too many tinned foods as the tins are heavy. Many items of food, including milk, are now available in dehydrated form and

as such are very light, though more expensive. Fresh meat is best bought on the day you are going to use it.

The Country Code

These ten simple rules were prepared by the Countryside Commission as a guide to those who do not fully understand the rural way of life, to guard against them doing harm to animals and farm machinery and to preserve the beauty of the countryside.

1. Guard against all risk of fire
2. Fasten all gates
3. Keep dogs under proper control
4. Keep to the paths across farm land
5. Avoid damaging fences, hedges and walls
6. Leave no litter
7. Safeguard water supplies
8. Protect wild life, wild plants and trees
9. Go carefully on country roads
10. Respect the life of the countryside

When cooking or camping take particular care to observe Rules Nos. 1, 6 and 7. The risk of fire can be minimized by using a paraffin pressure stove or butane gas stove, rather than making a wood fire. But whichever you choose, take care in selecting the site for your camp kitchen. Keep away from hedges, haystacks or long grass – dry, barren ground is safest. If you choose a wood fire, always cut back turf from the fireplace which you can replace afterwards. Before you leave make absolutely certain that your fire is out by pouring water over the ground.

Always ask permission before camping or even cooking on private ground and if told you are trespassing, apologize and leave at once.

To avoid contaminating the ground, stream, ponds and wells, whenever possible use public conveniences or ask permission of the owner of the land to use his W.C.

Using the Roads – Hints for Cyclists

If you want to explore a wider area than you can conveniently cover on foot and particularly if the places of interest which you want to see are far apart, you may find it convenient to use your cycle for exploring.

This is healthier and cheaper than relying upon public transport to get you about and has the added advantage that you can travel at times which suit you.

But just as it is important to take care on the mountains, so too is it vital to observe the rules of the road. With the ever-increasing number of private cars and commercial vehicles on the roads, the cyclist must learn to tolerate them and above all to give very clear signals of what he is going to do so that other road users can act accordingly. Remember that because a bicycle is relatively unstable, and the cyclist has little protection, he is most likely to get injured irrespective of who is at fault, so take care!

The following general rules about cycling are taken from the *Highway Code* and have been drawn up for your guidance:

1. If a road has a special cycle track, always use it.

2. When cycling in company with others, never ride more than two abreast, so as to give other road users – especially fast motor traffic – plenty of room. If you are on a busy road, it is safest to ride in single file, keeping close to the left-hand kerb.

3. Never carry anything on your cycle which interferes with the handle bars or front wheel or brakes, or which is so awkward in shape or size that it makes balancing difficult.

4. Never hold on to another vehicle or another cyclist, and do not ride too close behind any other vehicle.

Apart from those rules, there are certain other things you must or must not do or you will be breaking the law. The most important of these are:

5. Always stop at traffic lights when they are against you, at pedestrian crossings when pedestrians are using them, and at 'Stop' and 'Give Way' signs. You must also stop when any policeman in uniform or traffic warden signals you to do so.

6. Unless you are riding a tandem cycle, you must never carry any other person on your cycle.

7. You must always have a red reflector showing to the rear of your cycle, and you must always show a red light to the rear and a white

light to the front when riding during lighting-up time. If for any reason your lights will not work, you must walk your cycle, preferably along the pavement.

8. Your tyres must always be in good condition, and your brakes must always be efficient.

Road Signs and Signals

It is important when cycling to give other road-users very clear indications in advance of one's intentions. Figure 8 shows the hand signals which should be made by every cyclist.

If it is dangerous to take your hands off the handlebars to make any of these signals, pull into the side of the road and stop. Make sure there is no other traffic near by before going on.

Turning right Turning left Slowing down

Fig. 8. Cyclist's hand signals

In addition, all road-users should know the meaning of road-signs. Some of the modern, continental style of signs are shown in Figure 9.

The New Level Crossings

New level-crossing barriers, rather like those in use on the Continent, are being installed in many places. These barriers are worked automatically by approaching trains. Red flashing lights and a gong start to operate as a warning shortly before the barrier begins to fall. The barrier itself also has red lights on it.

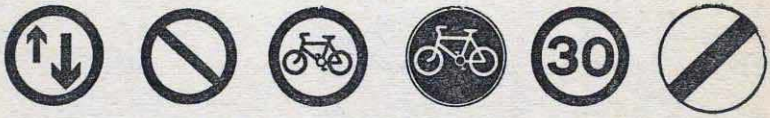
Never pass any red lights when they are flashing or the gong when it is sounding, and never under any circumstances try to zig-zag past the

Warning Signs

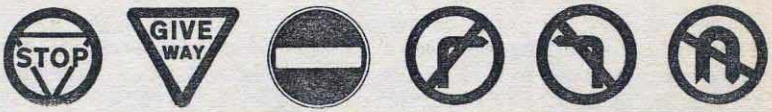
Distance to stop sign ahead; Two-way traffic ahead; Steep hill downwards; Pedestrian crossing; Level crossing without gates or barrier; Traffic lights

Distance to give way sign ahead; Side road; Road works; Crossroads; Uneven Road; Roundabout

Orders



Give priority to vehicles from opposite direction; No waiting; Cycles prohibited; Cyclists only; Maximum speed limit; End of maximum speed limit



Stop and give way; Give way to traffic on major road; No entry; No right turn; No left turn; No U turns

Fig. 9. Road signs

barriers when they are down. You may think it is safe to do so because you have just seen a train pass; but as all the stop signs are still in operation another train is approaching – either in the opposite direction or following the first one.

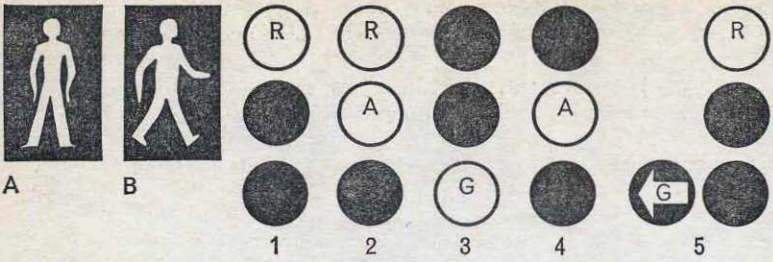


Fig. 10. Traffic signals. These must be obeyed by all traffic on public roads.

A Pedestrians wait.
B Pedestrians cross now.
1 RED means STOP
2 RED and AMBER means STOP but be ready to proceed when green appears.
3 GREEN means PROCEED if safe to do so.
4 AMBER means STOP unless too close to stop-line.
5 GREEN ARROW means proceed only in direction indicated.

Road Markings

When on any road which is marked with double white lines down the middle, the rules are:

If the line nearer to you is continuous, you must never cross it.

If the line nearer to you is broken, you may cross it for the purpose of overtaking; but you must be back on your correct side of the road before the start of any continuous line on that side.

These rules concern motorists more than cyclists; it is never safe for any cyclist on a busy road to be so far from the left-hand side of the road that he has to cross any line painted down the middle.

Pedestrian Crossings

The rules for crossing the road at 'zebra crossings' (which are indicated by flashing yellow lights) are:

1. If there is no policeman controlling the crossing, you have the right to cross at any time, *but always be sure to give approaching traffic time to*

stop. This is particularly important on wet days, because if you cause a motorist to put on his brakes suddenly he may skid right into you.

2. If there *is* a policeman or traffic warden controlling the crossing, you must wait until he stops the traffic for you before you step off the kerb.

At other kinds of crossing you must obey the lights or the signals given by a policeman. If the crossing is not controlled in any way, you may cross only when the road is clear – traffic is not bound to stop for you.

Further Reading

The Observer Pocket Series (Warne).
I-Spy British Wild Animals (Dickens Press).
I-Spy in the Hedgerow (Dickens Press).
Map Reading for the Countrygoer (Ramblers' Association).
Understand Maps, Nancy Scott (Wills & Hepworth).
Know the Game – Map Reading (Educational Productions).
Safety in the Mountains (CCPR).
Mid Moor and Mountain, M. Balsillie and J. Westwood (Boy Scouts Association).
The Hike Book, J. Cox (Lutterowrth).
Art of Cycling, N. Spencer (Thorsons).
The Highway Code (HMSO).
A Handbook for Naturalists, Ed. Winwood Reade & R. M. Stuttard (Evans).

Communications

In these days of communications satellites such as *Early Bird* and of inexpensive short wave radio apparatus, messages and also pictures are being sent much more frequently by radio waves, even over quite short distances, than in the past. However, in some circumstances, particularly when emergencies occur at sea or in the air and the modern equipment fails, the longer established methods of sending messages come into their own once again.

Wavelength Allocation

Radio air-space for broadcasting (sound only and vision plus sound) is divided into a number of bands ranging from the long wave (low frequency) band for amplitude modulated sound to the ultra-short wave (ultra-high frequency) bands for television and for frequency modulated sound. The names of the various bands together with their respective frequency and wavelength ranges are as follows:

		Wavelength	*Frequencies*
Low frequency (long waves)		600–2,000 m.	150– 500 kHz
Medium frequency (medium waves)		195– 600 m.	500– 1,510 kHz
High frequency (short waves)		10– 80 m.	3,750–30,000 kHz
Very high frequency (ultra-short waves)	Band I	4·41–7·32 m.	41– 68 MHz
	Band II	3·00–3·43 m.	87·5–100 MHz
	Band III	1·39–1·72 m.	174–216 MHz
Ultra-high frequency (ultra-short waves)	Band IV	51–63 cm.	475–585 MHz
	Band V	31–49 cm.	610–960 MHz

Frequencies are measured in kilo- and mega- Hertz, which are the new names for kilo- and mega- (1,000 and 1,000,000) cycles per second. Frequency (n) and wavelength (λ) are connected by the equation:

$$v = n \times \lambda$$

where v is the velocity of electromagnetic waves (300,000,000 m./sec.)

European Long and Medium Wave Stations

The following list shows some of the principal sound broadcasting transmitters in the UK and in Europe.

Key to Countries. B = Belgium; D = Denmark; E = England; F = France; G = Germany; IR = Republic of Ireland; It = Italy; L = Luxembourg; N = Norway; Ne = Netherlands; NI = Northern Ireland; Sc = Scotland; Sn = Sweden; Sw = Switzerland; W = Wales.

Footnotes to list

1 BBC Radio 1
2 BBC Radio 2
3 BBC Radio 3
4 BBC Radio 4 (London)
5 BBC Radio 4 (Midlands)
6 BBC Radio 4 (North)
7 BBC Radio 4 (West)
8 BBC Radio 4 (Welsh)
9 BBC Radio 4 (Scotland)
10 BBC Radio 4 (Northern Ireland)

Wavelength (metres)	*Station*	*Power (Kilowatts)*
Long Wave		
1829	Allouis	500
1734	Moscow (USSR)	500
1571	Motala (Sn)	150
1500	Droitwich[2] (E)	400
1376	Oslo (N)	200
1224	Kalundborg (D)	150
Medium Wave		
567	Beromünster (Sw)	150
530	Athlone (IR)	100
506	Sundsvall (Sn)	150
483	Brussels (B)	150
464	Daventry[3] (E)	150
457	Florence (It)	180
434	Moorside Edge[6] (E)	150
402	Hilversum (Ne)	120
393	Sottens (Sw)	150
388	Stockholm (Sn)	150
371	Westerglen[9] (Sc)	100
371	Burghead[9] (Sc)	100
347	Paris (F)	150
341	Washford[8] (E)	100
334	Milan (It)	150
330	Brookman's Park[4] (E)	140
324	Brussels (B)	150
309	Hamburg (G)	100
303	Berlin (G)	300
298	Hilversum (Ne)	120
285	Start Point[7] (E)	100
280	France III	100
276	Droitwich[5] (E)	150
261	Stagshaw[6] (E)	100
251	Munich (G)	150
247	Brookman's Park[1] (E)	50
247	Moorside Edge[1] (E)	50
247	Westerglen[1] (Sc)	50
247	Burghead[1] (Sc)	20
228	Stavanger (N)	100
225	Rome (It)	80
224	Lisnagarvey[10] (NI)	100
208	Luxembourg (L)	350
206	Clevedon[2] (E)	20

VHF/FM Stations

There are at present about 70 VHF/FM sound-broadcasting stations in the United Kingdom, and each station broadcasts BBC Radio 2, 3 and 4 programmes, but not Radio 1.

Frequencies (in mega-Hertz = MHz) vary according to district, and the following ranges on the tuning dial of an FM set should be searched for any particular local programme:

Radio 2: 88·1 to 90·1 Radio 3: 90·3 to 92.4 Radio 4: 92·5 to 95·85

Exceptionally the frequencies used by the relay station at Les Platons (Jersey) are

Radio 2: 91·1 Radio 3: 94·75 Radio 4: 97·1

Searching the Short Waves

Short Waves travel very great distances, but are likely to 'fade' at certain times of the day. The best time for receiving short-wave-transmissions vary with wavelength, as follows: around 16 metres, when both transmitter and receiver are in daylight; 19 metres, when both are in twilight; 25 metres, when the transmitter is in daylight and the receiver is in darkness; 31 metres, when the transmitter is in darkness and the receiver is in daylight; 49 metres, when both are in darkness.

When searching for overseas short-wave stations, try the following times and wavelengths: *Europe*, daytime 16 metres, evening 25 metres, and 49 metres; *Canada and America*, afternoon 16 metres, twilight 19 metres, evening 25 metres; *Australia and Far East*, sunrise to noon, 31 metres.

UK Television Stations

The five channels (Numbers 1–5) in Band I and eight (Numbers 6–13) in Band II are used for the BBC-1 and various independent television companies' transmissions. The BBC has 25 main 405-line transmitters (the majority using channels in Band I), while the ITA uses 30 main transmitters (in Band II only) for putting out the various (regional) independent television companies' programmes. BBC has some 80 and the ITA some 12 low-power local relay stations in use or planned to serve areas where reception from the main transmitters is poor.

The BBC's second television programme BBC-2 was inaugurated in April 1964 and, after experiments during the summer of 1967, the BBC started regular transmissions in colour in December 1967 on the same channels as it uses for BBC-2. These new services differ technically from BBC-1 in that the BBC-2 picture is scanned by 625 instead of 405 lines – making the signals directly suitable for transmission to Europe and the pictures much sharper in detail. In addition the wavelength of the signals is much shorter. Colour has also been used on BBC-1 and ITV transmission from November 1969.

The BBC already operates over 10 main, 625-line transmitters on channels in Bands IV and V. In addition, the BBC plans several more main stations and many relay stations making a total in all of about 50.

The ITA started a duplicate service on 625-line in UHF during 1969 and introduced colour transmission from November 1969.

Emergency Signals

The best known distress signal is S O S (short for 'Save Our Souls'), made in Morse Code by any means available – radio, hooters, and sirens, banging on drums, or even tapping on walls. The Morse Code for S O S is three dots, three dashes, three dots: ● ● ● — — — ● ● ●

However, a number of other signals are used by ships and aircraft in distress.

Ships in Distress use the following:
(*a*) Signalling the letters S O S in Morse Code by radio or any other means;

(*b*) Speaking the word 'Mayday' (from the French *m'aidez*, 'help me') over the radio;

(*c*) A gun or other explosive signal fired at intervals of about a minute;

(*d*) The International Code flags N C;

(*e*) The 'distant signal' consisting of a square flag having either above or below it a ball or anything resembling one;

(*f*) Sounding continuously any siren or fog-signalling apparatus;

(*g*) Flames on the vessel (as from a flare, a burning oil or tar barrel, a brazier filled with oil-soaked rags);

(*h*) Rockets throwing red stars fired one at a time at short intervals;

(*i*) A rocket parachute flare showing a red light.

Aircraft in Distress
Apart from S O S given continuously by anything which can be heard at sufficient distance (radio, siren, or fog-horn) the pilot of an aircraft requiring urgent assistance can give any of the following signals:

(*a*) The 'mayday' signal spoken continuously over the radio;

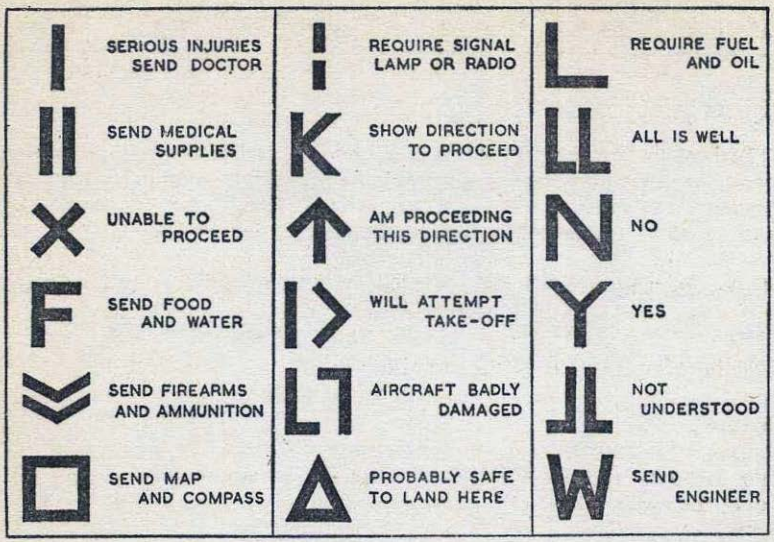


Fig. 11. Aircraft ground signals

(*b*) Fire red Very lights at short intervals;

(*c*) the International Code flags N C;

(*d*) the 'distant signal' as for ships above.

Aircraft Ground Signals

When an aircraft has made a forced landing, the pilot of the grounded aircraft can signal to passing aircraft by means of the signals shown in Figure 11. The shapes can be made of cloth, pieces of wood, stones, even trampled snow, and should be at least eight feet long.

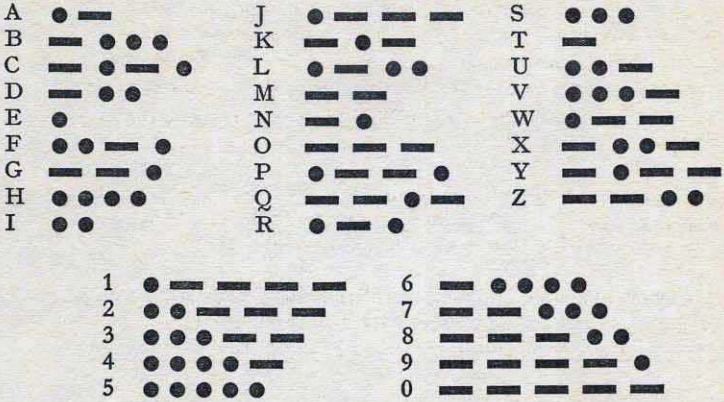
Morse Code

This code was invented by Samuel Morse in 1838 for sending messages by telegraph. Experienced Morse operators are able to tap out an average of 20 words (or 100 letters) a minute; automatic transmitters reach a speed of 40 to 50 words a minute.

The Code is made up of dots and dashes, a dash being three times the

length of the dot. The time allowance between one symbol and the next is the length of a dot, between complete letters about two dots, and between words a dash.

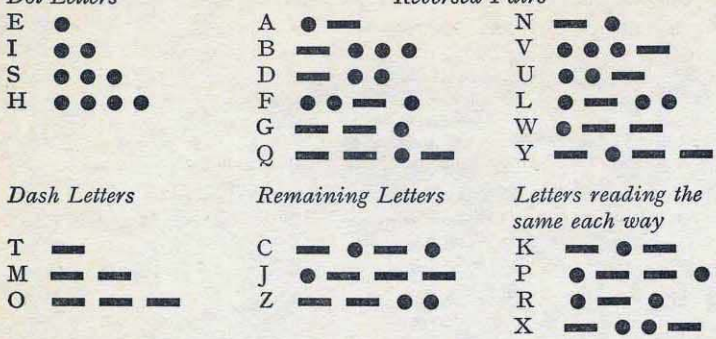
Here is the complete Morse Code:



Full Stop (AAA)
Apostrophe
Oblique Stroke
Brackets (KK)
Short Break
Beginnings (CT)
Hyphen
Inverted Commas (RR)
Underline (UK)
Question (IMI)
Long Break (BT)
Ending (AR)
Finish of transmission for an indefinite period (VA)

(*Note:* CT is sent before each individual message, and is often repeated continuously for a stand-by signal; AR is sent to denote the end of a message but not the end of the transmission – the receiver still has to stand by until he gets the VA.)

Many people find it easier to learn the Code when they split the letters up into groups of similar letter codes, thus:



(*Note:* Learn the dot and the dash letters first, then the reversed pairs, then the letters reading the same each way.)

Secret Codes and Ciphers

One of the *disadvantages* of using radio for transmitting messages is that anyone who has a suitable receiver and who cares to tune it to the right wavelength can intercept the message. However, messages sent by radio can be kept secret if they are sent in a code which is known only by the sender and the recipient.

In the simplest form of code each letter in the message is replaced by another letter. For instance the letters of the code alphabet may be displaced by one or two places in relation to the plain language alphabet,

ABCDEFGHIJKLMNOPQRSTUVWXYZ
YZABCDEFGHIJKLMNOPQRSTUVWX

Thus, in place of A we write Y and for E we write C. The message 'Return to base' then becomes 'Pcrspl rm zyqc'.

Instead of displacing each letter of the alphabet by the same number of places, we can start the code alphabet with a code word such as ZEBRA (in which no letter is repeated). The remaining letters of the alphabet then follow in order, *e.g.*

ABCDEFGHIJKLMNOPQRSTUVWXYZ
ZEBRACDFGHIJKLMNOPQSTUVWXY

The message 'Get help quickly' becomes 'Das fajn otgbijx'.

A somewhat more complicated substitution code is obtained if we arrange the letters of the code alphabet haphazardly, *e.g.*

ABCDEFGHIJKLMNOPQRSTUVWXYZ
OXYJANCFIZMBTPSDGVLWREQUHK

'Await further instructions' then becomes 'Oqoiw nrvwfav iplwvrywispl'.

As one letter always represents the same other letter in simple substitution codes, they can be solved or 'broken' quite easily. To do this we take advantage of the frequency with which letters occur in the English language. In English *e* occurs most often followed by *t* and *a*. In addition to the two letter words such as *an*, *at*, *on* and *in*, certain pairs of letters occur more frequently than others, *e.g. th*, *er* and *st*. The most common doubles are *ee*, *oo*, *ll*, *ss*, and *ff*.

Since secret messages are sent by radio only if they are urgent, code breakers have to work rapidly to solve a code. In an effort to confuse their work, we can change our code at regular intervals, for instance by using a new code word.

Messages sent in the Playfair code – which uses a five-line square of letters as its key – are more difficult to understand because different letters can represent the same letter in the plain language alphabet. The five-line square starts with a code word in which no letter is repeated (*e.g.* COUNTRYSIDE) followed by the remaining letters in order. (I and J count as one).

C	O	U	N	T
R	Y	S	I	D
E	A	B	F	G
H	K	L	M	P
Q	V	W	X	Z

To put a message into the Playfair code we split the words of the message into pairs of letters irrespective of the ends of the words, thus 'me et in th eo ld ba rn'. We then find where these pairs of letters fall in the square and replace them by the letters in the opposite corners of the rectangles. Thus *Me* becomes *Hf*. If both letters appear in the same horizontal or vertical line, we take the letter immediately to the right or below as the case may be. Thus *in* becomes *fi*. The whole message then becomes 'Hfgc fi cpa cps fbic'.

Secret codes are sometimes called *ciphers* to distinguish them from the recognized business codes which are used throughout the world as a means of shortening telegrams and cables. Books giving details of the latter types of codes are generally available and enable messages to be sent more quickly and at less expense than if they were spelt out in full.

Data for Spotters

Railways of Great Britain

As a result of neglect and failure to replace obsolete and worn out equipment during and immediately after World War II British Rail lost both freight and passenger traffic and hence money. In an effort to give the railways a new lease of life and to attract some forms of traffic back from the roads and also from the domestic airline routes, an immense plan to modernize the whole railway system was announced in 1955. The plan included gradually replacing steam locomotives by diesel or electric locos, electrifying some trunk and suburban lines and modernizing rolling stock, signalling and other equipment.

Loco Numbering

All British Rail locomotives are numbered to enable operating and engineering staff to identify them. Usually each class of locos occupies a block of numbers in the lists. The few diesel and electric locomotives which had been built before the railways were nationalized in 1948 were given numbers in the 10,000 and 20,000 series.

Rather than adopt six-figure numbers for diesel and electric locomotives when these were ordered in comparatively large numbers as part of the modernization programme, British Rail introduced two new series of numbers, each starting from 1, but having the prefix D for Diesels and E for Electric. Just as many steam locos had names as well as numbers so too do some of the passenger diesel and electric locos.

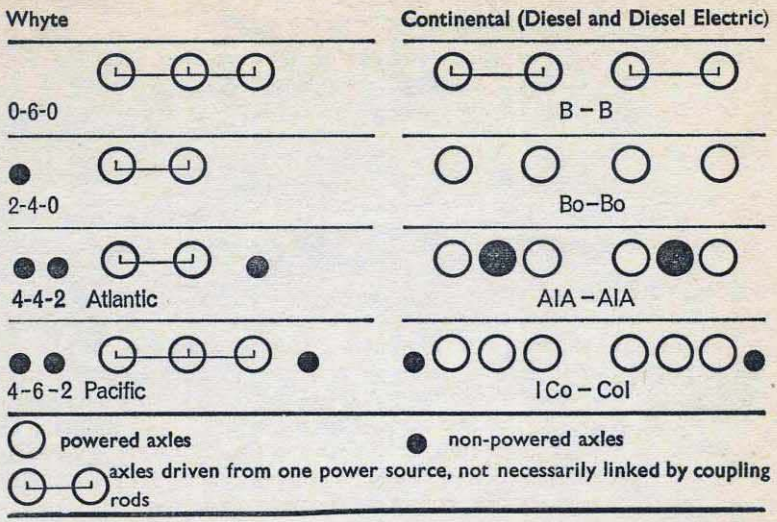


Fig. 12. Locomotive-wheel plans

Locomotive Wheel Plans

There are two systems of denoting the wheel plans of locomotives:

The Whyte System. This system uses a group of three numbers separated by hyphens, the first number being the total number of leading wheels, the second number the total number of driving wheels, the third number the total number of trailing wheels. Wheels on tenders are ignored. Thus 2–6–4 represents two leading wheels, six driving wheels and four trailing wheels.

The Continental System. This system uses a combination of letters and numbers and, in contrast with the Whyte system in which all wheels are counted, the Continental system counts axles. Further, the number of driving axles is indicated by a letter: A = 1, B = 2, C = 3 and so on, while unpowered axles are denoted by a figure. A small o after a letter indicates that the driving axles on that bogie each have their own driving motors: they are not coupled. For example, if an electric locomotive has two four-wheel bogies with one motor on each bogie connected to both driving axles by coupling rods or driving shafts, the loco would be described as a B–B. However, if all the axles are individually powered

Fig. 13. Four character headcode

it would be described as a Bo–Bo. The Continental system is used in Britain for diesels (except shunters) and electric locomotives.

Locomotive Headcodes

To enable railway staff, and particularly signalmen, to identify approaching trains, the locomotives or the leading coaches of multiple-unit trains display a headcode. The majority of diesel, diesel-electric and electric locos and also the diesel multiple-unit trains use the four character headcode which gives the destination and sometimes the train number, in addition to the classification of the train. Exceptionally, Southern Region electric multi-unit trains have two character numerical headcodes which indicate only the destination of the trains.

In the four character classification the letter occupying the second position indicates the destination area of the train: this varies from region to region. The figures in the third and fourth position indicate either the route or the number of the train.

The first numeral indicates the nature of the train as follows:

1. Express passenger or newspaper train; or a breakdown or snowplough train going to clear an obstructed line.

2. Stopping passenger train; or a breakdown train not on its way to clear an obstructed line.

3. Parcel, livestock or perishable goods train composed entirely of vehicles conforming to coaching stock requirements; or empty coaching stock train.

4. Express freight train pipe-fitted throughout with automatic brakes operating on at least nine-tenths of the vehicles.

5. Express freight train, partly fitted with automatic brakes operating on at least half the vehicles.

6. Express freight train with automatic brakes operating on at least one-fifth of the vehicles; or express freight train of limited load not fitted with the automatic brake.

7. Express freight train not fitted with the automatic brake.

8. Through freight train not running under the previous four headcodes.

9. Freight train stopping at intermediate stations.

0. Light engine; light engines coupled; engine with not more than two brake vans.

If you are a keen loco-spotter, the name and number of each loco you see and record are your main interest – that, after all, is the point of your hobby. But collecting engine numbers is not the end of loco-spotting: studying locos, as all serious loco-spotters do, leads one to an interest in the working of locos and of the whole railway system, also to an interest in the history and geography of railways and of their time tables. There is not space here to say more about railways, but many books have already been written about various aspects of this fascinating subject, and some are listed on page 115.

Sea Fishing Boat Distinguishing Marks

All sea fishing boats, with the exception of open and undecked boats which are navigated only by oars, have to be registered with HM Customs and Excise. Upon registration, boats are given a distinguishing mark which comprises one or more letters followed by a number. The distinguishing letters, which identify the port (or inland town) of registration, are listed below.

A	Aberdeen	BE	Barnstaple	BRD	Broadford
AA	Alloa	BF	Banff	BS	Beaumaris
AB	Aberystwyth	BH	Blyth	BU	Burntisland
AD	Ardrossan	BK	Berwick-on-Tweed	BW	Barrow-in-Furness
AH	Arbroath	BL	Bristol	CE	Coleraine
AR	Ayr	BM	Brixham	CF	Cardiff
B	Belfast	BN	Boston	CH	Chester
BA	Ballantrae	BO	Bo'ness	CK	Colchester
BCK	Buckie	BR	Bridgwater	CL	Carlisle
BD	Bideford				

CN	Campbeltown
CO	Caernarvon
CR	Cardigan
CS	Cowes
CT	Castletown
CY	Castlebay
DE	Dundee
DH	Dartmouth
DO	Douglas
DR	Dover
DS	Dumfries
E	Exeter
F	Faversham
FD	Fleetwood
FE	Folkestone
FH	Falmouth
FR	Fraserburgh
FY	Fowey
GE	Goole
GH	Grangemouth
GK	Greenock
GN	Grantown-on-Spey
GR	Gloucester
GU	Guernsey
GW	Glasgow
GY	Grimsby
H	Hull
HH	Harwich
HL	Hartlepools
IE	Irvine
IH	Ipswich
INS	Inverness
J	Jersey
K	Kirkwall
KY	Kirkaldy
LA	Llanelly
LH	Leith
LI	Littlehampton
LK	Lerwick
LL	Liverpool
LN	(King's) Lynn
LO	London
LR	Lancaster
LT	Lowestoft
LY	Londonderry
M	Milford Haven
ME	Montrose
MH	Middlesbrough
ML	Methil
MN	Maldon
MR	Manchester
MT	Maryport
N	Newry
NE	Newcastle upon Tyne
NN	Newhaven
NT	Newport, Mon.
OB	Oban
P	Portsmouth
PD	Peterhead
PE	Poole
PGW	Port Glasgow
PH	Plymouth
PL	Peel
PN	Preston
PT	Port Talbot
PW	Padstow
PZ	Penzance
R	Ramsgate
RN	Runcorn
RO	Rothesay
RR	Rochester
RX	Rye
RY	Ramsey
SA	Swansea
SC	Scilly
SD	Sunderland
SE	Salcombe
SH	Scarborough
SM	Shoreham-by-Sea
SN	North Shields
SR	Stranraer
SS	St. Ives
SSS	South Shields
SU	Southampton
ST	Stockton-on-Tees
SY	Stornoway
TH	Teignmouth
TN	Troon
TO	Truro
TT	Tarbert
UL	Ullapool
WA	Whitehaven
WH	Weymouth
WI	Wisbech
WK	Wick
WN	Wigtown
WO	Workington
WY	Whitby
YH	(Great) Yarmouth

Aircraft International Registration Marks

All civil aircraft must have a registration mark which must show clearly on the wings. In any registration mark, the first group of letters shows the country of origin; the second group indicates the identity of

the aircraft. Thus: F—ABC means 'Aircraft ABC of France'. Marks of country of origin are given below.

AN	Nicaragua
AP	Pakistan
B	China
CC	Chile
CCCP	Russia
CF	Canada
CN	Morocco
CP	Bolivia
CR	Portuguese Colonies
CS	Portugal
CU	Cuba
CX	Uruguay
D	West Germany
DDR	East Germany
EC	Spain
EI	Eire
EL	Liberia
EP	Iran
ET	Ethiopia
F	France
G	United Kingdom
HA	Hungary
HB	Switzerland
HC	Ecuador
HH	Haiti
HI	Dominica
HK	Columbia
HL	Korea
HP	Panama
HR	Honduras
HS	Thailand
HZ	Saudi Arabia
I	Italy
JA	Japan
JY	Jordan
JZ	Netherlands New Guinea
LN	Norway
LQ	Argentina
LV	Argentina
LX	Luxembourg
LZ	Bulgaria
MC	Monaco
N	United States
OB	Peru
OD	Lebanon
OE	Austria
OH	Finland
OK	Czechoslovakia
OO	Belgium
OY	Denmark
PH	Netherlands
PI	Philippines
PJ	Netherlands West Indies
PK	Indonesia
PP	Brazil
PT	Brazil
PZ	Surinam
SE	Sweden
SP	Poland
ST	Sudan
SU	UAR (Egypt)
SX	Greece
TC	Turkey
TF	Iceland
TG	Guatemala
TI	Costa Rica
TJ	Cameroon
TL	Central African Rep.
TN	Congo
TR	Gabon
TS	Tunisia
TU	Ivory Coast
TZ	Mali
VH	Australia
VPB	Bahamas
VPF	Falkland Islands
VPG	Guyana
VPH	British Honduras
VPM	Malta
VPS	Somalia
VPP	Western Pacific Islands
VPT	Trinidad and Tobago
VPV	St. Vincent
VPX	The Gambia
VPY	Rhodesia
VQB	Barbados
VQF	Fiji Islands
VQG	Grenada
VQH	St. Helena
VQL	St. Lucia
VQM	Mauritius
VQS	Seychelles
VR	Rumania
VRA	South Arabia
VRB	Bermuda
VRH	Hong Kong
VRO	Malaysia
VRS	Singapore
VRU	Brunei
VRW	Malaysia
VT	India
XA	Mexico
XB	Mexico
XC	Mexico
XT	Upper Volta
XU	Cambodia
XV	Vietnam
XW	Laos

XY	Burma	ZS	South Africa	5X	Uganda
XZ	Burma	ZT	South Africa	5Y	Kenya
YA	Afghanistan	ZU	South Africa	6V	Senegal
YE	Yemen			6W	Senegal
YI	Iraq	3A	Monaco	6Y	Jamaica
YJ	New Hebrides	3X	Guinea	7T	Algeria
YK	Syria	4R	Ceylon	9G	Ghana
R	Rumania	4X	Israel	9K	Kuwait
YS	Salvador	5A	Libya	9L	Sierra Leone
YU	Yugoslavia	5B	Cyprus	9M	Malaysia
YV	Venezuela	5H	Tanzania	9N	Nepal
ZA	Albania	5N	Nigeria	9O	Congolese Rep.
ZK	New Zealand	5R	Madagascar	9Q	Congolese Rep.
ZL	New Zealand	5T	Mauretania	9U	Rwanda
ZM	New Zealand	5U	Niger		
ZP	Paraguay	5W	West Samoa		

Motor Vehicle International Identity Marks

Any motor vehicle which is taken abroad (*i.e.* out of its country of registration) must show its country of origin by means of an international identity mark on an oval disc fitted to the rear of the car.

A	Austria	CDN	Canada	EAT	Tanzania
ADN	Aden	CGO	Congo (Leopoldville)	EAU	Uganda
AL	Albania			EAZ	Tanzania
AND	Andorra	CH	Switzerland	EC	Ecuador
AUS	Australia	CI	Ivory Coast	ET	UAR (Egypt)
		CL	Ceylon		
B	Belgium	CNB	Sabah-Malaysia	F	France; all French overseas departments
BDS	Barbados	CO	Colombia		
BG	Bulgaria	CR	Costa Rica		
BH	British Honduras	CS	Czechoslovakia		
		CY	Cyprus	FL	Liechtenstein
BL	Lesotho				
BP	Botswana	D	West Germany	GB	Great Britain and Northern Ireland
BR	Brazil	DK	Denmark		
BRG	Guyana	DOM	Dominican Republic		
BRN	Bahrein			GBA	Alderney
BRU	Brunei	DY	Dahomey	GBG	Guernsey
BS	Bahamas	DZ	Algeria	GBJ	Jersey
BUR	Burma			GBM	Isle of Man
		E	Spain	GBY	Malta
C	Cuba	EAK	Kenya	GBZ	Gibraltar

GCA	Guatemala
GH	Ghana
GR	Greece
H	Hungary
HK	Hong Kong
I	Italy
IL	Israel
IND	India
IR	Iran
IRL	Republic of Ireland
IRQ	Iraq
IS	Iceland
J	Japan
JA	Jamaica
JOR	Jordan
K	Cambodia
KWT	Kuwait
L	Luxembourg
LAO	Laos
LT	Libya
MA	Morocco
MC	Monaco
MEX	Mexico
MS	Mauritius
MW	Malawi
N	Norway
NA	Netherlands Antilles
NIC	Nicaragua
NIG	Niger
NL	Netherlands
NZ	New Zealand
P	Portugal and Portuguese overseas territories
PA	Panama
PAK	Pakistan
PE	Peru
PI	Philippines
PL	Poland
PTM	Malaya Malaysia
PY	Paraguay
R	Rumania
RA	Argentina
RC	Formosa (Taiwan)
RCA	Central African Republic
RCB	Congo (Brazzaville)
RCH	Chile
RH	Haiti
RI	Indonesia
RIM	Islamic Republic of Mauretania
RL	Lebanon
RM	Malagasy Republic
RMM	Mali
RNR	Zambia
RSM	San Marino
RSR	Rhodesia
RU	Burundi
RWA	Republic of Ruanda and Kingdom of Burundi
S	Sweden
SD	Swaziland
SF	Finland
SGP	Singapore
SK	Sarawak Malaysia
SME	Surinam
SN	Senegal
SU	Russia
SWA	South-west Africa
SY	Seychelles
SYR	Syria
T	Thailand
TG	Togo
TN	Tunisia
TR	Turkey
TT	Trinidad and Tobago
U	Uruguay
USA	USA
V	Vatican City
VN	Vietnam
WAG	The Gambia
WAL	Sierra Leone
WAN	Nigeria
WD	Dominica
WG	Grenada
WL	St. Lucia
WS	Western Samoa
WV	St. Vincent
YU	Yugoslavia
YV	Venezuela
ZA	South Africa

Motor Vehicle Index Marks

Although the majority of modern motor vehicles first registered in the United Kingdom have three-letter index marks, the identity of the

original Licensing Authority (County or County Borough Council) is revealed by the last two letters. Thus if the index mark on a number plate is shown as GDF, the first letter is ignored, leaving the letters DF (= Gloucestershire in the list which follows).

In all index marks the letters may either precede or follow the figures (*e.g.* SRO 852 or 852 SRO), and there may be an additional letter added after the figures (*e.g.* SRO 852F) the isolated letter indicating the year when the vehicle was first registered. A was issued in 1963, B in 1964. With effect from August 1967, the year for this purpose runs from August 1 until July 31, with F the year letter for 1967/68. So SRO 852F would be the index for a vehicle first licensed in Hertfordshire (RO) in 1967/68.

As a result of reorganization of local government, particularly in the Greater London area some of the index marks have been reallocated. The new authorities, which are issuing registration marks with year letters, are given below, the original authorities are given in notes at the end of the list as are a few exceptions (*e.g.* GPO and USN).

CD (on oval plate) – *Corps Diplomatique.*

List of Index Marks

A	London	AS	Nairnshire	BG	Birkenhead
AA	Hampshire	AT	Kingston-upon-Hull	BH	Buckinghamshire
AB	Worcestershire	AU	Nottingham	BI	Monaghan (county)
AC	Warwickshire	AV	Aberdeenshire	BJ	East Suffolk
AD	Gloucestershire	AW	Shropshire	BK	Portsmouth
AE	Bristol	AX	Monmouthshire	BL	Berkshire
AF	Cornwall	AY	Leicestershire	BM	Bedfordshire
AG	Ayrshire	AZ	Belfast	BN	Bolton
AH	Norfolk			BO	Cardiff
AI	Meath (county)	B	Lancashire	BP	West Sussex
AJ	Yorkshire, North Riding	BA	Salford	BR	Sunderland
AK	Bradford	BB	Newcastle-upon-Tyne	BS	Orkney
AL	Nottinghamshire	BC	Leicester	BT	Yorkshire, East Riding
AM	Wiltshire	BD	Northamptonshire	BU	Oldham
AN	London[1]	BE	Lindsey (Lincolnshire)	BV	Blackburn
AO	Cumberland	BF	Staffordshire	BW	Oxfordshire
AP	East Sussex			BX	Carmathenshire
AR	Hertfordshire				

BY	London[2]
BZ	Down (county)
C	Yorkshire, West Riding
CA	Denbighshire
CB	Blackburn
CC	Caernarvonshire
CD	Brighton
CE	Cambridgeshire
CF	West Suffolk
CG	Hampshire
CH	Derby
CI	Laoighis (county)
CJ	Herefordshire
CK	Preston
CL	Norwich
CM	Birkenhead
CN	Gateshead
CO	Plymouth
CP	Halifax
CR	Southampton
CS	Ayrshire
CT	Kesteven (Linconshire)
CU	South Shields
CV	Cornwall
CW	Burnley
CX	Huddersfield
CY	Swansea
CZ	Belfast
D	Kent
DA	Wolverhampton
DB	Stockport
DC	Tees-side
DD	Gloucestershire
DE	Pembrokeshire
DF	Gloucestershire
DG	Gloucestershire
DH	Walsall
DI	Roscommon (county)
DJ	St. Helens
DK	Rochdale
DL	Isle of Wight
DM	Flintshire
DN	York
DO	Holland (Lincolnshire)
DP	Reading
DR	Plymouth
DS	Peebles-shire
DT	Doncaster
DU	Coventry
DV	Devon
DW	Newport (Mon.)
DX	Ipswich
DY	Hastings
DZ	Antrim (Co.)
E	Staffordshire
EA	West Bromwich
EB	Cambridgeshire[3]
EC	Westmorland
ED	Warrington
EE	Grimsby
EF	Hartlepool
EG	Huntingdon[4]
EH	Stoke-on-Trent
EI	Sligo (Co.)
EJ	Cardiganshire
EK	Wigan
EL	Bournemouth
EM	Bootle
EN	Bury
EO	Barrow-in-Furness
EP	Montgomeryshire
ER	Cambridgeshire
ES	Perthshire
ET	Rotherham
EU	Breconshire
EV	Essex
EW	Huntingdonshire
EX	Great Yarmouth
EY	Anglesey
EZ	Belfast
F	Essex
FA	Burton-on-Trent
FB	Bath
FC	Oxford
FD	Dudley
FE	Lincoln
FF	Merionethshire
FG	Fife
FH	Gloucester
FI	Tipperary, North Riding
FJ	Exeter
FK	Worcester
FL	Huntingdon[1]
FM	Chester
FN	Canterbury
FO	Radnorshire
FP	Rutland
FR	Blackpool
FS	Edinburgh
FT	Tynemouth
FU	Lindsey, (Lincolnshire)
FV	Blackpool
FW	Lindsey (Lincolnshire)

FX	Dorset
FY	Southport
FZ	Belfast
G	Glasgow
GA	Glasgow
GB	Glasgow
GC	London
GD	Glasgow
GE	Glasgow
GF	London
GG	Glasgow
GH	London
GJ	London
GK	London
GL	Bath
GM	Motherwell and Wishaw
GN	London
GO	London
GP	London[7]
GR	Sunderland
GS	Perthshire
GT	London
GU	London
GV	West Suffolk
GW	London
GX	London
GY	London
GZ	Belfast
H	London[1]
HA	Warley
HB	Merthyr Tydfil
HC	Eastbourne
HD	Dewsbury
HE	Barnsley
HF	Wallasey
HG	Burnley
HH	Carlisle
HI	Tipperary, South Riding
HJ	Southend-on-Sea
HK	Essex
HL	Wakefield
HM	London[6]
HN	Darlington
HO	Hampshire
HP	Coventry
HR	Wiltshire
HS	Renfrewshire
HT	Bristol
HU	Bristol
HV	London[6]
HW	Bristol
HX	London[5]
HY	Bristol
HZ	Tyrone (Co.)
IA	Antrim (Co.)
IB	Armagh (Co.)
IC	Carlow (Co.)
ID	Cavan (Co.)
IE	Clare (Co.)
IF	Cork (Co.)
IH	Donegal (Co.)
IJ	Down (Co.)
IK	Dublin (city and Co.)
IL	Fermanagh (Co.)
IM	Galway (Co.)
IN	Kerry (Co.)
IO	Kildare (Co.)
IP	Kilkenny (Co.)
IR	Offaly (Co.)
IT	Leitrim (Co.)
IU	Limerick (Co.)
IW	Londonderry (Co.)
IX	Longford (Co.)
IY	Louth (Co.)
IZ	Mayo (Co.)
J	Durham (Co.)
JA	Stockport
JB	Berkshire
JC	Caernarvonshire
JD	London[1]
JE	Cambridgeshire[3]
JF	Leicester
JG	Canterbury
JH	Hertfordshire
JI	Tyrone (county)
JJ	London
JK	Eastbourne
JL	Holland (Lincolnshire)
JM	Westmorland
JN	Southend-on-Sea
JO	Oxford
JP	Wigan
JR	Northumberland
JS	Ross and Cromarty
JT	Dorset
JU	Leicestershire
JV	Grimsby
JW	Wolverhampton
JX	Halifax
JY	Plymouth
JZ	Down (Co.)
K	Liverpool
KA	Liverpool
KB	Liverpool
KC	Liverpool
KD	Liverpool

KE	Kent
KF	Liverpool
KG	Cardiff
KH	Kingston-upon-Hull
KI	Waterford (county)
KJ	Kent
KK	Kent
KL	Kent
KM	Kent
KN	Kent
KO	Kent
KP	Kent
KR	Kent
KS	Roxburghshire
KT	Kent
KU	Bradford
KV	Coventry
KW	Bradford
KX	Buckingham-shire
KY	Bradford
KZ	Antrim (Co.)
L	Glamorgan
LA	London
LB	London
LC	London
LD	London
LE	London
LF	London
LG	Cheshire
LH	London
LI	Westmeath (Co.)
LJ	Bournemouth
LK	London
LL	London
LM	London
LN	London
LO	London
LP	London
LR	London
LS	Selkirkshire
LT	London
LU	London
LV	Liverpool
LW	London
LX	London
LY	London
LZ	Armagh (Co.)
M	Cheshire
MA	Cheshire
MB	Cheshire
MC	London[5]
MD	London[5]
ME	London[5]
MF	London[5]
MG	London[5]
MH	London[5]
MI	Wexford (Co.)
MJ	Bedfordshire
MK	London[5]
ML	London[5]
MM	London[5]
MN	Isle of Man
MO	Berkshire
MP	London[5]
MR	Wiltshire
MS	Stirlingshire
MT	London[5]
MU	London[5]
MV	London[5]
MW	Wiltshire
MX	London[5]
MY	London[5]
MZ	Belfast
N	Manchester
NA	Manchester
NB	Manchester
NC	Manchester
ND	Manchester
NE	Manchester
NF	Manchester
NG	Norfolk
NH	Northampton
NI	Wicklow (Co.)
NJ	East Sussex
NK	Hertfordshire
NL	Northumber-land
NM	Bedfordshire
NN	Nottingham-shire
NO	Essex
NP	Worcestershire
NR	Leicestershire
NS	Sutherland
NT	Shropshire
NU	Derbyshire
NV	Northampton-shire
NW	Leeds
NX	Warwickshire
NY	Glamorgan
NZ	Londonderry
O	Birmingham
OA	Birmingham
OB	Birmingham
OC	Birmingham
OD	Devon
OE	Birmingham
OF	Birmingham
OG	Birmingham
OH	Birmingham
OI	Belfast
OJ	Birmingham
OK	Birmingham
OL	Birmingham
OM	Birmingham

ON	Birmingham
OO	Essex
OP	Birmingham
OR	Hampshire
OS	Wigtownshire
OT	Hampshire
OU	Hampshire
OV	Birmingham
OW	Southampton
OX	Birmingham
OY	London[1]
OZ	Belfast
P	Surrey
PA	Surrey
PB	Surrey
PC	Surrey
PD	Surrey
PE	Surrey
PF	Surrey
PG	Surrey
PH	Surrey
PI	Cork
PJ	Surrey
PK	Surrey
PL	Surrey
PM	East Sussex
PN	East Sussex
PO	West Sussex
PP	Buckingham-shire
PR	Dorset
PS	Shetland
PT	Durham (county)
PU	Essex
PV	Ipswich
PW	Norfolk
PX	West Sussex
PY	Yorkshire, North Riding
PZ	Belfast
Q, QA, QB, etc.,	London: for vehicles temporarily imported from abroad
R	Derbyshire
RA	Derbyshire
RB	Derbyshire
RC	Derby
RD	Reading
RE	Staffordshire
RF	Staffordshire
RG	Aberdeen
RH	Kingston upon Hull
RI	Dublin (city and Co.)
RJ	Salford
RK	London
RL	Cornwall
RM	Cumberland
RN	Preston
RO	Hertfordshire
RP	Northampton-shire
RR	Nottingham-shire
RS	Aberdeen
RT	East Suffolk
RU	Bournemouth
RV	Portsmouth
RW	Coventry
RX	Berkshire
RY	Leicester
RZ	Antrim (Co.)
S	Edinburgh
SA	Aberdeenshire
SB	Argyll
SC	Edinburgh
SD	Ayrshire
SE	Banffshire
SF	Edinburgh
SG	Edinburgh
SH	Berwickshire
SJ	Bute
SK	Caithness
SL	Clackmannan-shire
SM	Dumfries-shire
SN	Dunbarton-shire[8]
SO	Morayshire
SP	Fife
SR	Angus
SS	East Lothian
ST	Inverness-shire
SU	Kincardine-shire
SV	Kinross-shire
SW	Kirkudbright-shire
SX	West Lothian
SY	Midlothian
SZ	Down (Co.)
T	Devon
TA	Devon
TB	Lancashire
TC	Lancashire
TD	Lancashire
TE	Lancashire
TF	Lancashire
TG	Glamorgan
TH	Carmarthen-shire
TI	Limerick
TJ	Lancashire
TK	Dorset
TL	Kesteven (Lincolnshire)

TM	Bedfordshire
TN	Newcastle-upon-Tyne
TO	Nottingham
TP	Portsmouth
TR	Southampton
TS	Dundee
TT	Devon
TU	Cheshire
TV	Nottingham
TW	Essex
TX	Glamorgan
TY	Northumberland
TZ	Belfast
U	Leeds
UA	Leeds
UB	Leeds
UC	London
UD	Oxfordshire
UE	Warwickshire
UF	Brighton
UG	Leeds
UH	Cardiff
UI	Londonderry
UJ	Shropshire
UK	Wolverhampton
UL	London
UM	Leeds
UN	Denbighshire
UO	Devon
UP	Durham (Co.)
UR	Hertfordshire
US	Glasgow
UT	Leicestershire
UU	London
UV	London
UW	London
UX	Shropshire
UY	Worcestershire
UZ	Belfast
V	Lanarkshire
VA	Lanarkshire
VB	London[1]
VC	Coventry
VD	Lanarkshire
VE	Cambridgeshire
VF	Norfolk
VG	Norwich
VH	Huddersfield
VJ	Herefordshire
VK	Newcastle-upon-Tyne
VL	Lincoln
VM	Manchester
VN	Yorkshire, North Riding
VO	Nottinghamshire
VP	Birmingham
VR	Manchester
VS	Greenock
VT	Stoke-on-Trent
VU	Manchester
VV	Northampton
VW	Essex
VX	Essex
VY	York
VZ	Tyrone (Co.)
W	Sheffield
WA	Sheffield
WB	Sheffield
WC	Essex
WD	Warwickshire
WE	Sheffield
WF	Yorkshire, East Riding
WG	Stirlingshire
WH	Bolton
WI	Waterford
WJ	Sheffield
WK	Coventry
WL	Oxford
WM	Southport
WN	Swansea
WO	Monmouthshire
WP	Worcestershire
WR	Yorkshire, West Riding
WS	Edinburgh
WT	Yorkshire, West Riding
WU	Yorkshire, West Riding
WV	Wiltshire
WW	Yorkshire, West Riding
WX	Yorkshire, West Riding
WY	Yorkshire, West Riding
WZ	Belfast
X	Northumberland
XA	Kirkaldy[9]
XB	Coatbridge[9]
XC	Solihull[9]
XD	Luton[9]
XE	Luton[9]
XF	London
XG	Tees-side
XH	London
XI	Belfast
XJ	Manchester
XK	London
XL	London
XM	London
XN	London
XO	London

XP	London	YM	London	ZH	Dublin (city and Co.)
XR	London	YN	London		
XS	Paisley	YO	London	ZI	Dublin (city and Co.)
XT	London	YP	London		
XU	London	YR	London	ZJ	Dublin (city and Co.)
XV	London	YS	Glasgow		
XW	London	YT	London	ZK	Cork (Co.)
XX	London	YU	London	ZL	Dublin (city and Co.)
XY	London	YV	London		
XZ	Armagh (Co.)	YW	London	ZM	Galway (Co.)
		YX	London	ZN	Meath (Co.)
Y	Somerset	YY	London	ZO	Dublin (city and Co.)
YA	Somerset	YZ	Londonderry		
YB	Somerset			ZP	Donegal (Co.)
YC	Somerset	Z	Dublin (city and Co.)	ZR	Wexford (Co.)
YD	Somerset			ZT	Cork (Co.)
YE	London	ZA	Dublin (city and Co.)	ZU	Dublin (city and Co.)
YF	London				
YG	Yorkshire, West Riding	ZB	Cork (Co.)	ZW	Kildare (Co.)
		ZC	Dublin (city and Co.)	ZX	Kerry (Co.)
YH	London			ZY	Louth (Co.)
YI	Dublin (city and Co.)	ZD	Dublin (city and Co.)	ZZ	Dublin: for vehicles temporarily imported from abroad
YJ	Dundee	ZE	Dublin (city and Co.)		
YK	London				
YL	London	ZF	Cork		

[1] Formerly West Ham County Borough Council.
[2] Formerly Croydon County Borough Council.
[3] Formerly Isle of Ely County Council.
[4] Formerly Soke of Peterborough County Council.
[5] Formerly Middlesex County Council.
[6] Formerly East Ham County Borough Council.
[7] Exceptionally GPO is allocated to (Greater) London and is reserved exclusively for use on post office vehicles.
[8] Exceptionally USN is allocated to (Greater) London and is reserved exclusively for use on United States service vehicles.
[9] Formerly (Greater) London County Council.

Land, Water, and Air Records

Land

The man who holds the record for being the fastest man on wheels is Craig Breedlove (USA) who, in 1965, in a four-wheeled jet-propelled

car the *Spirit of America*, set up an official speed of 608·21 m.p.h. at Bonneville Salt Flats, Utah, USA. R. Summers (USA) in a four-wheeled direct drive car, *Goldenrod*, achieved an official 410·220 m.p.h. at Bonneville Salt Flats, in 1965.

Water

The distinction of being the world's fastest man on water is held by Lee Taylor, Jr. (USA) who reached the official record speed of 285·213 m.p.h. in the hydroplane *Hustler* on Lake Guntersville, USA, in 1967.

The Blue Riband: An award given to the ship which makes the fastest crossing of the North Atlantic. It is held by USS *United States*, which won it in 1952 with a time of 3 days 10 hours 40 minutes, from Ambrose Light (USA) to Bishop Rock Light (Scillies), 3,144 miles. On the return crossing her time was 3 days 12 hours 12 minutes. The award was previously won by RMS *Queen Mary* in 1938 which made the crossing from Bishop's Rock Light in 3 days 21 hours 48 minutes and the return crossing (Eastwards) in 3 days 20 hours 42 minutes.

Air

The top speed in the air has not been disclosed, but it has reached more than six times the speed of sound (which is about 760 m.p.h. at sea-level).

The world's official air-speed record was achieved in 1965 by Col. R. L. Stephens and Lt.-Col. D. Andre of the US Air Force who averaged 2,070·1 m.p.h. Other high speeds are: 2,094 m.p.h. by Capt. M. G. Apt, USAF, in an X-2 research plane; and 4,534 m.p.h. by Major William Knight also of the USAF, in an X-15 rocket plane (1967).

The X-15 also holds the altitude record (19 miles). Previous altitude records are 90,560 feet (over 17 miles) up by Comdr. L. Flint, US Navy, in a Phantom II jet; 86,660 feet (over 16 miles) by a manned TU-431 Russian jet (July 1959).

Further Reading

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World Railways, H. Samson (Sampson Low).
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Jane's Fighting Ships, R. Blackmore (Sampson Low).
Aircraft 'sixtyeight, J. W. R. Taylor (Ian Allen).
Jane's All the World's Aircraft, J. W. R. Taylor (Sampson Low).
The Observer's World Aircraft Directory, William Green (Warne).
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I-Spy Cars (Dickens Press).
I-Spy Buses and Coaches (Dickens Press).
The Observer's Book of Commercial Vehicles, L. A. Manwaring (Warne).

Sporting Records

Association Football

League Champions

1955–56	Manchester United
1956–57	Manchester United
1957–58	Wolverhampton Wanderers
1958–59	Wolverhampton Wanderers
1959–60	Burnley
1960–61	Tottenham Hotspur
1961–62	Ipswich Town
1962–63	Everton
1963–64	Liverpool
1964–65	Manchester United
1965–66	Liverpool
1966–67	Manchester United
1967–68	Manchester City
1968–69	Leeds United
1969–70	Everton
1970–71	Arsenal
1971–72	Derby County
1972–73	Liverpool

F.A. Cup Winners

1956	Manchester City
1957	Aston Villa
1958	Bolton Wanderers
1959	Nottingham Forest
1960	Wolverhampton Wanderers
1961	Tottenham Hotspur
1962	Tottenham Hotspur
1963	Manchester United
1964	West Ham
1965	Liverpool
1966	Everton
1967	Tottenham Hotspur
1968	West Bromwich Albion
1969	Manchester City
1970	Chelsea
1971	Arsenal
1972	Leeds United
1973	Sunderland

Scottish Cup Winners

1956	Heart of Midlothian	1965	Celtic
1957	Falkirk	1966	Rangers
1958	Clyde	1967	Celtic
1959	St. Mirren	1968	Dunfermline
1960	Rangers	1969	Celtic
1961	Dunfermline	1970	Aberdeen
1962	Rangers	1971	Celtic
1963	Rangers	1972	Celtic
1964	Rangers	1973	Rangers

European Cup Winners

1962	Benfica (Portugal)	1968	Manchester United
1963	A. C. Milan	1969	A. C. Milan
1964	Inter Milan	1970	Feyenoord
1965	Inter Milan	1971	Ajax
1966	Real Madrid	1972	Ajax
1967	Celtic	1973	Ajax

World Cup Winners

1934	Italy	1958	Brazil
1938	Italy	1962	Brazil
1950	Uruguay	1966	England
1954	Germany	1970	Brazil

Olympic Games Winners

1920	Belgium	1952	Hungary
1924	Uruguay	1956	USSR
1928	Uruguay	1960	Yugoslavia
1932	No competition	1964	Hungary
1936	Italy	1968	Hungary
1948	Sweden	1972	Poland

Athletics

World Records

Event	*Holder*	*Time* min.	sec.
100 yards	R. Hayes (USA)		9·1
100 metres	J. Hinds (USA)		9·9
220 yards	T. Smith (USA)		19·5
200 metres	T. Smith (USA)		19·8

Event	*Holder*	*Time* min.	sec.
440 yards	J. Smith (USA)		44·5
400 metres	L. Evans (USA)		43·8
880 yards	J. Ryun (USA)	1	44·9
800 metres	P. G. Snell (NZ)	1	44·3
	R. Doubell (Australia)	1	44·3
1000 metres	J. May (Germany)	2	16·2
	F. Kemper (Germany)	2	16·2
1 mile	J. Ryun (USA)	3	51·1
3000 metres	K. Keino (Kenya)	7	39·6
3 miles	R. Clarke (Australia)	12	50·4
5000 metres	R. Clarke (Australia)	13	16·6
110 metres hurdles	M. Lauer (Germany)		13·2
	L. Calhoun (USA)		13·2
	E. McCulloch (USA)		13·2
400 metres	D. Hemery (GB)		48·1
		ft.	*in.*
High jump	V. Brumel (USSR)	7	5¾
Long jump	R. Beamon (USA)	29	2½
Triple jump	P. Perez (Cuba)	57	1
Pole Vault	R. Seagren (USA)	18	5¾
Discus	L. Silvester (USA)	224	5
Hammer	W. Schmidt (Germany)	258	8
Javelin	J. Lusis (USSR)	307	9
Shot	R. Matson (USA)	71	5¼

(The above records are those which have been officially ratified at the time of going to press. However, as the ratification committees do not meet very often, it is quite likely that some of the above records have already been broken.)

Cricket

County Championships

1955	Surrey	1961	Hampshire	1967	Yorkshire
1956	Surrey	1962	Yorkshire	1968	Yorkshire
1957	Surrey	1963	Yorkshire	1969	Glamorgan
1958	Surrey	1964	Worcestershire	1970	Kent
1959	Yorkshire	1965	Worcestershire	1971	Surrey
1960	Yorkshire	1966	Yorkshire	1972	Warwickshire

Gillette 'Knock Out' Cup

1967	Kent	1970	Lancashire
1968	Warwickshire	1971	Lancashire
1969	Yorkshire	1972	Lancashire

Lawn Tennis

Wimbledon Champions

	Men's Singles	*Men's Doubles*
1954	J. Drobny	R. N. Hartwig and M. G. Rose
1955	M. A. Trabert	R. N. Hartwig and L. A. Hoad
1956	L. A. Hoad	L. A. Hoad and K. R. Rosewall
1957	L. A. Hoad	G. Mulloy and B. Patty
1958	A. J. Cooper	S. Davidson and U. Schmidt
1959	A. Olmedo	R. Emerson and N. A. Fraser
1960	N. A. Fraser	R. H. Osuna and R. D. Ralston
1961	R. Laver	R. Emerson and N. A. Fraser
1962	R. Laver	R. Hewitt and F. Stolle
1963	C. R. McKinley	R. H. Osuna and A. Palafox
1964	R. Emerson	R. Hewitt and F. Stolle
1965	R. Emerson	J. D. Newcombe and A. D. Roche
1966	M. Santana	K. N. Fletcher and J. D. Newcombe
1967	J. Newcombe	R. Hewitt and F. McMillan
1968	R. Laver	J. D. Newcombe and A. D. Roche
1969	R. Laver	J. D. Newcombe and A. D. Roche
1970	J. D. Newcombe	J. D. Newcombe and A. D. Roche
1971	J. D. Newcombe	R. Emerson and R. Laver
1972	S. R. Smith	R. A. J. Hewitt and F. D. McMillan

Davis Cup

1954	USA	1960	Australia	1966	Australia
1955	Australia	1961	Australia	1967	Australia
1956	Australia	1962	Australia	1968	USA
1957	Australia	1963	USA	1969	USA
1958	USA	1964	Australia	1970	USA
1959	Australia	1965	Australia	1971	USA

Rowing

University Boat Race

The race is rowed at the end of March or the beginning of April in each year from Putney to Mortlake, a distance of 4 miles 374 yards. The time of the race is at flood tide, one hour before it turns.

The first race was held in 1829, but the event did not become a regular annual fixture until 1856. During the two world wars (1914–18 and 1939–45) there were no official races, but meetings were held unofficially at various places.

1956	Cambridge	1962	Cambridge	1968	Cambridge
1957	Cambridge	1963	Oxford	1969	Cambridge
1958	Cambridge	1964	Cambridge	1970	Cambridge
1959	Oxford	1965	Oxford	1971	Cambridge
1960	Oxford	1966	Oxford	1972	Cambridge
1961	Cambridge	1967	Oxford	1973	Cambridge

Cambridge has won 67 times, Oxford 51 times.

Grand Challenge Cup

1956	Centre, Sportif des Forces de l'Armee, France	1966	R.S.C. Berlin, E. Germany
1957	Cornell University, USA	1967	S.C. Wissenschaft, E. Germany
1958	Trud Club, Leningrad, USSR	1968	London University B.C.
1959	Harvard University, USA	1969	Eindheit S.C., E. Germany
1960	Molesley B.C.	1970	A.S.K. Vorwarts, E. Germany
1961	USSR Navy	1971	Tideway Scullers, G.B.
1962	USSR Navy	1972	W.M.F. Moscow, USSR
1963	London University B.C.		
1964	USSR		
1965	Ratzeburger R.V., W. Germany		

Diamond Sculls

1955	T. Kocerka (Poland)	1964	S. Cromwell (USA)
1956	T. Kocerka (Poland)	1965	D. M. Spero (USA)
1957	S. A. Mackenzie (Australia)	1966	A. Hill (Germany)
1958	S. A. Mackenzie (Australia)	1967	M. Studach (Switzerland)
1959	S. A. Mackenzie (Australia)	1968	H. A. Wardell-Yerburgh (UK)
1960	S. A. Mackenzie (Australia)	1969	H. J. Bohmer (E. Germany)
1961	S. A. Mackenzie (Australia)	1970	J. Meissner (W. Germany)
1962	S. A. Mackenzie (Australia)	1971	A. Demeddi (Argentina)
1963	G. Kottman (Switzerland)	1972	A. Timoschinin (USSR)

Rugby League Football

Challenge Cup Winners

1955	Barrow	1964	Widnes
1956	St. Helens	1965	Wigan
1957	Leeds	1966	St. Helens
1958	Wigan	1967	Featherstone Rovers
1959	Wigan	1968	Leeds
1960	Wakefield Trinity	1969	Castleford
1961	St. Helens	1970	Castleford
1962	Wakefield Trinity	1971	Leigh
1963	Wakefield Trinity	1972	St. Helens

Northern League Championship

1954–55	Warrington	1963–64	Swinton (First Division)
1955–56	Hull	1964–65	Halifax
1956–57	Oldham	1965–66	St. Helens
1957–58	Hull	1966–67	Wakefield Trinity
1958–59	St. Helens	1967–68	Wakefield Trinity
1959–60	Wigan	1968–69	Leeds
1960–61	Leeds	1969–70	St. Helens
1961–62	Huddersfield	1970–71	St. Helens
1962–63	Swinton (First Division)	1971–72	Leeds

Rugby Union Football

International Championship

1955	France	1961	France	1968	France
	Wales	1962	France	1969	Wales
1956	Wales	1963	England	1970	France
1957	England	1964	Scotland		Wales
1958	England		Wales	1971	Wales
1959	France	1965	Wales	1972	Wales
1960	England	1966	Wales		(2 matches were not
	France	1967	France		played)

Swimming

World Records (Men)

Event	*Holder*	*Time*	
		min.	*sec.*
100 metres freestyle	M. Spitz (USA)		51·5
200 metres freestyle	M. Spitz (USA)	1	53·5
400 metres freestyle	K. Krumpholz (USA)	4	00·0
800 metres freestyle	B. Cooper (Australia)	8	23·8
1500 metres freestyle	R. De Mont (USA)	15	52·9
100 metres breaststroke	M. Pamkin (USSR)	1	5·8
200 metres breaststroke	J. Hencken (USA)	2	22·8
100 metres butterfly	M. Spitz (USA)		55·6
200 meters butterfly	M. Spitz (USA)	2	1·5
100 metres backstroke	R. Matthes (E. (Germany)		57·8
200 metres backstroke	R. Matthes (E. Germany)	2	6·4
200 metres individual medley	G. Larsson (Sweden)	2	9·3
	G. Hall (USA)	2	9·3
400 metres individual medley	G. Hall (USA)	4	33·9
4×100 metres freestyle relay	D. Havens	3	28·8
	M. Weston		
	B. Frawley		
	F. Heckl		
4×200 metres freestyle relay	M. Spitz	7	43·3
	J. Heidenrich		
	F. Tyler		
	T. McBreen		

British National Records (Boys)

Event	*Holder*	*Time*	
		min.	*sec.*
110 yards freestyle	K. Burns		57·1
220 yards freestyle	R. J. Terrell	2	3·5
440 yards freestyle	J. McClatchley	4	32·6
110 yards backstroke	A. Davison	1	3·9
220 yards backstroke	A. Davison	2	17·5
110 yards breaststroke	M. O Connell	1	11·5
200 yards breaststroke	D. Waller	2	40·2

Event	*Holder*	*Time*	
		min.	*sec.*
110 yards butterfly	A. Widdowson	1	2·1
220 yards butterfly	A. Widdowson	2	19·9
220 yards individual medley	R. J. Terrell	2	19·6
400 metres individual medley	R. J. Terrell	5	2·6

Channel Swimmers

The distance between Cap Gris Nez in France to Dover in England is some 20 miles, but because of tides a swimmer crossing the Strait has to swim very much farther, the actual distance depending upon when and where he enters the water in relation to the state of the tide, and how long he takes in crossing.

The first Channel swimmer was Capt. Matthew Webb (England), who in 1875 swam from Dover to Calais in 21¾ hours, covering about 40 miles in the effort.

The next swimmer was Thomas Burgess (England), who in 1911 also crossed from Dover to Calais, taking 22 hr. 35 min. Since 1923 the time has been greatly reduced.

Fastest crossing: France to England, Barry Watson (UK), 9 hr. 35 min. (1964).
England to France, Helge Jeusew (Canada), 10 hr. 23 min. (1960).
Only man to cross six times: Brojan Das (Pakistan).

The Olympic Games

The present series of Olympic Games began in 1896, and have been held in the following places: Athens (1896), Paris (1900), St. Louis (1904), London (1908), Stockholm (1912), Antwerp (1920), Paris (1924), Amsterdam (1928), Los Angeles (1932), Berlin (1936), London (1948), Helsinki (1952), Melbourne (1956), Rome (1960), Tokyo (1964), Mexico (1968), Munich (1972).

In the 1972 Games the events won by competitors representing the UK were: Equestrian Three-day Individual Event (R. Meade); Equestrian Three-day Team Event; Flying Dutchman Class Yachting (R. Pattisson); Pentathlon (M. Peters).

Venue for the 1976 Games: Montreal.

What shall I do?

How often have you asked yourself this question – on a day when the weather is too bad to go out of doors, on a long journey or when ill in bed? Reading and listening to the radio help to while away some of the time, but these can eventually become boring and one starts looking for other ways of occupying oneself.

This chapter is intended to give briefly some ideas of ways to answer the question at the top of the page. Possible things to do can be divided into four large groups: collecting, modelling, finding out and playing games just for fun – not that the other three are not enjoyable. These divisions may already suggest to you some ways of passing the time, but if not read on and we shall look at them in a little more detail.

Things to do on a wet day

Collecting

From time to time, most of us try our hands at collecting such things as postage stamps, postmarks, picture postcards, matchbox tops, crests, coins, feathers, shells, leaves or flowers, and a wet day provides an ideal opportunity to sort through new items and put them in their correct place in the collection, and to discard duplicates or poor specimens.

If the weather is still bad when you have done all this, find out more about your chosen hobby – collecting things is more than accumulating objects in a shoe box. That is only the beginning. You will find your collection much more interesting – and your friends will *want* to see it – if you have arranged it neatly, labelled the various items and know something about them.

Magazines and books cover the majority of popular hobbies so have a look for them next time you go to your public library or into your local bookshop. Above all be a knowledgeable collector – not just an accumulator!

Modelling

This section is intended to give you some new ideas, not so much for making models, but for making useful articles – toys and decorations, even presents – from inexpensive materials which are likely to be available in many homes.

Making a mobile. This form of decoration consists basically of one or more wire frames from which you hang fairly light objects. When hung from the ceiling in a good draught, it is fascinating to watch the hanging objects moving in different directions in space – this is a form of Kinetic Art.

One of the simplest forms of mobile can be built up on a wire coat hanger. You could colour halves of egg shells, and hang these by fine thread from the wire frame. Alternatively you can cut shapes – fish or birds or just squares, triangles and circles – from coloured card and attach them to the frame. You will find there is quite a knack in deciding the positions of the objects required to achieve both artistic and physical balance. If you use stiff wire instead of a coat hanger, you will probably find the mobile looks better if the main wire is not hanging from its mid-point, but to do that you will have to balance the weight carefully.

Carving. Have you ever tried whittling? All you need is a sharp knife and a piece of freshly cut wood. Make thin rather than deep cuts even if you want to halve the thickness of your stick and *always* push the knife away from you. Start off by making something simple, such as a paper knife. You could even make a collection of such knives carefully rubbed down and oiled to show the grains of different woods.

When you become more proficient you can try your hand at whittling solid shapes – such as animals and birds. A forked stick will provide the extra thickness you will need for such objects. Once you start you will find certain pieces of stick suggest particular shapes to whittle. If you cannot find any suitable fresh-cut sticks on a wet day you can always try carving cheap tablets of soap or modelling with Plaster of Paris or clay.

Paper mâché is another useful material for making all manner of things from heads of puppets, to trays, bowls and relief maps of hilly areas. You will need old newspaper, a large bowl, some wall-paper paste, a paste brush, water, a base upon which to build and some white shelf paper.

First you tear the paper into small pieces and put them into a bowl of water. While the paper is getting thoroughly soaked, make the wall-paper paste. Once the pieces of paper are really wet you are ready to start. Spread paste evenly over the base, then squeeze out as much water as possible from the pieces of paper and slowly lay these out over the base. Take care to smooth each piece out carefully avoiding creases and bubbles. Gradually build up the thickness, pasting between each layer of paper.

If you want some parts to be thicker than others – if for instance you are making a head for a puppet – the nose and cheeks will need to be built up, while if you have chosen a relief map hills need the same treatment. When your object is thick enough and you have achieved the right shape finish off with two layers of pieces of very wet white paper (shelf paper will do admirably). Once you have completed this stage you must leave the object in a warm place. Do not try lifting the object off its base until it is thoroughly dry, otherwise the shape will be lost. Finally finish it off with paint or varnish.

Keeping a sketch book

You may not think that a wet day is the best time to start a sketch book, but it will give you the opportunity to try your skill and also to experiment with different materials. Try using charcoal, chalk, felt and other types of pen, instead of pencil.

Remember that sketches are quick jottings rather than finished drawings. Try to capture the main lines of movement – do not worry about details. Copy the cartoonist's technique of using just a few bold lines. Possible subjects for sketching on a wet day include a corner of your room, a view from your window, dog (or cat) coming in from the rain (plenty of movement as he shakes himself), or try to sketch from memory your street, the entrance to your school, a corner of the park or a view of a local beauty spot. Take the latter sketches with you next time you go to the place and see how good your memory is.

Odds and ends

With a lot of imagination there is no limit to the things which you can make from odds and ends. If you like making things it is worth having a special shelf, drawer or box in which you put useful oddments in readiness for a wet day or any other time when you have the urge to create something. But just as a collection of stamps or coins has to be sorted and arranged, so too must you keep your oddment collection tidy. Put the smaller items such as acorns, buttons, corks, drawing pins, paper clips and shells in boxes. Other useful items to keep include empty matchboxes, cotton reels, plastic yoghurt tubs, pieces of balsa wood, lengths of wire, assorted boxes and sheets of card, metal foil, insides of toilet rolls, and Christmas cards.

Finding out

A visit to the public library or a museum (if your town has one) is an ideal way of passing an hour or two on a wet day and can start you off

on a new hobby or interest. In towns which do not have a museum you will often find that the public library has a small display case of relics which have been found in the neighbourhood. Find out about them. From what period do they date? What did the people of that time do? You are now getting interested in either archaeology or local history – borrow a book about one or the other from the library and find out more. Are there any statues in the market place of your own town – or the nearest large town? If so, find out what made these people famous. If yours is an old town, find out when the old houses were built. In the older parts of the town modern shop fronts may have been put on to old houses, so look at the upper floors from the other side of the street. Notice the different building materials used.

If you do not want to go out, you could plan your next expedition for when the weather improves and if you are not very proficient at map reading, you have a splendid opportunity to learn the mapping signs. A good way of doing this is to draw the various signs on to small pieces of white card – one sign to each – and use the cards to play a form of 'snap'. You could try drawing from memory a sketch map of your neighbourhood.

Things to do on a long journey

However beautiful the scenery may be, sooner or later you will probably get bored with watching it aimlessly. As with many other activities, a journey can be much more interesting – and the time pass more quickly – if you have definite objectives; for instance, to record various landmarks along the route. So before you start the journey, whether you are going by coach, private car, train or by air, find out your route and plot it on a map. Notice whether you are likely to pass through any interesting places on the way – you will then know in advance some of the sites to look for.

Here are some of the things you can watch for. You will have a greater chance of seeing these items of interest if you are going by road as you will go right through the centres of some towns, but others can be seen equally well from a train.

1. white horses and other figures cut out on the side of chalk downs; stone circles, mounds and other relics of the early inhabitants of Britain;
2. old houses and cottages – estimate how old they are from their shape and the materials from which they are made;
3. stocks, pillories, whipping posts and ducking stools which were used

for punishing offenders years ago are sometimes to be seen on village greens;

4. notice the different types of boundaries – hedges, fences and dry stone or slate walls – used to divide fields. The choice depends upon materials available locally and how exposed the countryside is to wind.
5. what crops are growing and animals grazing in the fields? Learn the difference between the various breeds of cattle, pigs and sheep. Watch out also for wild life – ponies, deer, hares and rabbits.
6. notice the quaint names and signs outside country inns – also the pictorial sign boards beside the roads as you enter some towns and villages. Try going through the alphabet with inn names – Angel, Bell, Cartwright, Dolphin.

Looking for things of this sort can be much more fun if you have several companions with you on the journey, then the first person to spot any item scores a point. Give bonus points for the rarer items.

Parts of railway journeys can be less interesting – particularly if you are going through cuttings or the industrial outskirts of large towns, though you can always try estimating the speed of the train by counting the number of telegraph poles which you pass in a minute. The poles are planted at 50-yard intervals, so that if the train is travelling at 60 miles per hour (1 mile/min.) you will pass 35 poles (1,760 ÷ 50) in one minute. You can work out other speeds from this information.

Alternatively, you can find your own amusement in the train – for instance, see how many words you can write down in, say five minutes, from the letters of a long word such as archaeology. You can also make up a chain story – one person starts and part way through an exciting episode, breaks off, and someone else has to continue.

Further Reading

Junior Pears Leisure Book (Pelham).
Something to Do, Septima (Penguin).
Know the Game Photography (Educational Productions).
Know the Game Stamp Collecting (Educational Productions).
I-Spy Archaeology (Dickens Press).
I-Spy in the Hedgerow (Dickens Press).
I-Spy on a Car Journey (Dickens Press).
I-Spy on a Train Journey (Dickens Press).
Hobbies for Boys, Ed. Leslie Jackman (Evans).

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